THE IRON TRADE REVIEW

VOLUME XXXVI CLEVELAND, OHIO, JULY 2, 1903 NUMBER 27

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

There is a better feeling in the iron trade, though without any particular change in the week in the volume of business placed. The large rail contracts of last week, the additional business done by Western roads in the past week and the pending inquiries for rails, amounting to about 250,000 tons of standard sections, have inspired confidence in the continuance of demand from that source on a liberal scale for another year. Some improvement in the prospect for crops, as contained in reports from along important granger roads, has also helped to make sentiment in the iron trade. So far as specifications for the more important forms of finished material are concerned, large producers report that there has been little if any difference in the past two months from the rate of the preceding months in the present year. Some mistaken inferences have been made from the reports of the bookings of some of the important steel interests that have appeared from time to time. These indicated full employment of the capacity of the United States Steel Corporation, for example, until November of this year, and allowing for lines in which bookings were not so far ahead, the inference was that in other materials the entire output for this year was taken. Such estimates have been misleading in that in some cases, though not in rails, they represented estimates of large consumers—builders of steel cars, for example—whereas it was well known that specifications could not be forced from such buyers if their requirements were not up to the level of the estimates. That new business is not being placed in the volume of last year at this time is not as significant as has been considered in some estimates. Consumption continues very heavy; the particular change that has come over the trade is that buyers are relieved of the necessity of looking so far ahead in arranging for their supplies. So far as foundry pig iron is concerned, the situation is not changed except for some further settling in price. Buyers and sellers alike are hunting for the level on which business can be done freely, but have not found it, and may not for some weeks. Meantime the aggregate of small orders has been amounting to something and most furnaces are sold for one month to two months ahead. Some sales have been made at figures between $13 and $14 for No. 2 foundry iron at Southern furnace. Foundrymen, as recent conferences over molders' demands show, are quite positive in the position that wage advances are not warranted; they are also determined to get pig iron at the lowest figure possible, and have little notion of buying more than one or two months' supply. In the Birmingham district a suspension of coal mining at the furnace company properties has resulted from a disagreement between the operators and the miners. A concession of 2½ cents by the operators was not accepted. It is not believed the shut-down will result seriously. There is little new development in finished materials apart from rails. Steel bar prices have been reaffirmed. Plate tonnage is being sought rather more vigorously in Central territory, and in structural material the outlook is rather improved. The American Bridge Co. booked 6,500 tons the past week for Schenectady and 3,200 tons for Buffalo.

PITTSBURG.

OFFICE OF *The Iron Trade Review*, 429 PARK BUILDING, July 1.

There is a slight but well marked improvement in sentiment in the iron trade as compared with last week. There has been no weakening in prices of finished material, and business is slightly heavier. All stocks have been reduced to the lowest ebb and the greater buying is due to this fact. The indications all are for a good fall trade, as there is nothing to draw from except material yet to be made. Rail business now entered for 1904 delivery exceeds 500,000 tons, apart from Western orders closed the past week and not noting the tonnage which will have to be carried over, which may reach 400,000 tons, and new orders are being booked right along.

There is a fair chance that the wage scales of local molders and machinists for the year beginning July 1 will be adjusted without further difficulty. A meeting is now in session of the conference committees on the machinists' scale, and the molders are to hold a mass meeting Wednesday night to consider the proposition made them.

The position in Bessemer pig is noteworthy. Consumers, even the very large ones, are buying only from month to month, but are taking out of the market fully as much iron on such monthly orders as they formerly did on long time contracts. Some odd lots from furnaces not usually selling in this district have been absorbed, at cut prices, and the valley furnaces hold to prices formerly quoted. The foundry iron trade has been marked by the entry of a number of consumers, who have bought for early delivery to meet absolute requirements, there being no contracting ahead. In face of prospective better buying prices have continued to recede.

The steel market is comparatively quiet, there being only a fair amount of inquiry. The leading interest is a moderate seller of billets and sheet bars, at flat prices, but only to recognized customers, at prices slightly lower than named by outside interests. The lowest price which has appeared is $28 at mill for Bessemer billets.

Business is slightly better in plates and shapes, while there is more inquiry for steel bars. In iron bars the situation is still very unsettled, with the leading interest disposed to let outsiders take what little business is going at the large reductions they have recently made, and see if the market will not work round to a point nearer the old official basis. In merchant pipe the trade continues highly satisfactory, with several orders for large pipe for gas lines unplaced because the desired deliveries are very hard to secure. In tin plates the position is equally strong and the busy season bids fair to last much longer than usual.

Pig Iron.—We note a number of small lots of Northern foundry sold in this district at about $18.75, delivered Pittsburg, for No. 2. Inquiry is larger than for some time, but it is all for small lots and early shipment. There is no disposition among foundries to buy ahead, and even if the molders' wage matter was settled it is unlikely that there would be much forward buying. It is claimed that all the local foundries will have used up all the iron they have by Aug. 1. Furnaces have been gradually reducing quotations, until now $18.75, Pittsburg, is quoted by some interests for No. 2, others holding aloof by naming higher figures. The Southern furnaces are not naming any attractive figures in this market, as they could not hope to meet Northern iron with so large a freight rate against them. In Bessemer pig the situation this week is similar to the last week in December, consumers not being actively in the market. Iron bought has been mainly for July and not until July is well started will there be any heavy inquiry, and then only to round out the month. Consumers are committed to the policy of taking each month by itself. Valley furnaces have not weakened, and we quote same prices as formerly, $19, valley, for spot and $18.60 to $18.75 for forward shipment, with the probability that $18.50 could be done for August or September. It might be that lower prices would be named for still later delivery but as there is no inquiry it is not justifiable to make the assumption. Two or three lots of Bessemer from furnaces outside the usual territory selling iron to Pittsburg consumers have sold iron here at less than the valley prices, but this iron is now worked off. Gray forge is extremely quiet, and prices are simply nominal at a shade under foundry. We revise prices as follows, for prompt and July or August shipment:

Bessemer, Valley	$18 60 to 19 00
Bessemer, Pittsburg	19 45 to 19 85
No. 1 Foundry	19 00 to 19 50
No. 2 Foundry	18 50 to 19 00
Gray Forge, Pittsburg	18 50 to 18 75
Chilled Basic, Valley	18 75 to 19 00
Chilled Basic, Pittsburg	19 60 to 19 85

Steel.—On fair sized lots to regularly recognized customers the leading interest quotes $28 at mill for Bessemer billets, with a dollar advance for open-hearth, and $2 to $3 advance for sheet bars. Several such lots have been sold. For guaranteed prompt shipment slightly higher prices are obtained by outside sellers, and as high as $30, delivered Pittsburg, has been quoted on very small lots. The great bulk of a lot of foreign steel held for re-sale by an Eastern mill, and offered for several weeks through a large number of brokers, has been disposed of to a local wire interest, which takes out of the market offerings of many times the tonnage actually involved in the transaction, which was 1,500 tons of 4x4 billets, of various weights, and claimed to have brought $29.40, delivered Pittsburg district. There remains a small tonnage of the lot, mainly 5x5 billets. On strictly new business importers claim they cannot do less than $30.75 delivered Pittsburg for German Bessemer billets, which is of course a prohibitive price. A lot of 500 tons of German sheet bars bought by a nearby sheet tin plate interest, is now due at Baltimore. The starting of the Hainsworth steel works, under advisement for some time, has not been decided upon, and the steel corporation will make every effort to avoid starting the works, preferring to bring the greatest pressure on the works now in operation. More iron would have to be purchased if the Hainsworth works were started. Wire rods are quoted at $36.50 at mill for Bessemer.

Ferro-Manganese.—We quote large lots of imported 80 percent ferro at $50, delivered, and ordinary small lots at $52.50, very small lots bringing considerably higher figures.

Muck Bar.—The market has continued to weaken, and $33 is now quoted, with the possibility that this might be shaded on a very desirable order.

Skelp.—The market is possibly a little stronger, particularly for large sizes. One mill has withdrawn from the market by quoting 2c for grooved steel. On ordinary lots we quote: Iron, grooved, 1.90c; sheared, 1.95c to 2c; steel, grooved, 1.95c; sheared, 2c. On a good order these prices would be shaded.

Pipes and Tubes.—Trade continues in excellent shape, mills being as busy as possible and finding difficulty in making shipments as desired. Stocks are very low, particular efforts having been made since last fall to prevent any unhealthy accumulation. On large sizes the market is particularly stiff, and the one or two mills which can take orders for early shipment are very independent, refusing to hold quotations open even for a few days. Two large lots, one for 10-inch and one for 12-inch, have been in the market for some time and are about to be closed if the desired deliveries can still be obtained. We continue to quote as follows in carload lots to consumers, f. o. b. Pittsburg, plus freight according to Tube Rate Book to destination:

MERCHANT PIPE.

	Steel Pipe. Black. Percent.	Steel Pipe. Galv. Percent.	Wrought Iron Pipe. Black. Percent.	Wrought Iron Pipe. Galv. Percent.
⅛, ¼ and ⅜ inch	68	58	65	55
½ inch	70	60	67	57
¾ to 6 inch	75	65	72	62
7 to 12 inch	69	59	66	56
Plugged and Reamed				
1 to 4 inch	73	63	70	60
Cut 3 to 6 feet				
⅛, ¼ and ⅜ inch	63	52	60	49
½ inch	65	54	62	51
¾ to 6 inch	71	60	68	57
7 to 12 inch	65	53	61	50
Cut 6 feet and longer				
⅛, ¼ and ⅜ inch	64	53	61	50
½ inch	66	55	63	52
¾ to 6 inch	72	61	69	58
7 to 12 inch	66	54	62	51
Extra Strong Plain End				
¼ to 8 inch	67	57	63	53
Threads only	66	56	62	52
Threads and Couplings	65	55	61	51
Double Extra Strong Plain End				
½ to 8 inch	59	49	55	45
Threads only	58	48	54	44
Threads and Couplings	57	47	53	43

NOTE.—Orders for less than carload will be charged at 12½ percent advance. Extra and Double Extra Strong Cut Lengths, lower random discounts by 10 percent net for 6 feet and longer, and 15 percent net for 2 to 6 feet.

BOILER TUBES.

Steel.

	Percent.
1 to 1¼ inches	45
2¾ to 5 inches	62½
1¾ to 2¼ and 6 to 13 inches	52½

Iron.

	Percent.
1 to 1½ inches	36½
2¾ to 5 inches	45½
1¾ to 2¼ and 6 to 13 inches	35½

CASING.

	S. and S. Percent.
2 to to 3 inches	58
3¼ to 4 inches	60
4¼ to 12½ inches	63

Bars.—Last Friday the steel bar mills met in Pittsburg and formally reaffirmed prices. The market is a little more active, and this week there have been several inquiries for fairly large lots. In iron bars the situation is very little changed. Eastern mills generally are quoting 1.70c at mill, while Western mills quote 1.70c at Ohio mill and as low as 1.65c, Indiana mill, is quoted. Very little of such iron is coming to the Pittsburg district, as there is little demand, the main consumers being covered on old contracts. The leading interest is not recognizing the low quotations made, and prefers to let mills making such quotations fill up at such prices if they desire. Small lots may be picked up at 1.75c or 1.80c, delivered Pittsburg, but it appears that some buyers of small lots prefer to pay the higher official price and buy from an interest which customarily supplies this district. On hoops and bands there are reports that there has been some waiving of the differentials for small lots of a size, but this is believed to be confined entirely to some jobbers, the mills, at least the leading ones, adhering strictly to the recognized differentials. We quote the market as follows: Bessemer steel bars, 1.60c; open-hearth, 1.70c; plow beams and cultivator beams, 1.60c, net; channels, angles, zees and tees, Bessemer, under 3 inches, 1.70c; over 3 inches 1.80c; bar iron, 1.80c, Youngstown, or 1.83¾c, Pittsburg, with freight added to point of delivery from Youngstown. The following differentials maintain: Less than 2,000 pounds of a size and not less than 1,000 pounds, 10 cents advance; less

than 1,000 pounds of a size, 30 cents advance. Hoops and bands are quoted at 1.90c, full extras, in 250-ton lots and over, and 2c in less than 250-ton lots.

Rails and Track Material.—An order for 15,000 tons has just been taken from the Illinois Central for delivery the last quarter of this year. Next year's orders include 202,000 from the Pennsylvania interests, 40,000 each from the Chicago, Burlington & Quincy, and Chicago, Milwaukee & St. Paul, 35,000 from the Chicago & Northwestern, 50,000 from the Rock Island, 25,000 each from the Illinois Central and Lake Shore; while 90,000 from the Harriman systems is under inquiry and expected to be closed. Light rails are not overly strong. We quote: Standard sections, 50 pounds and over, in lots of 500 tons and over, $28; car lots and less than 500 tons, $30; less than car lots, $32; light rails, 8 pounds, in carload lots, $39; less than carload lots, $40; 12 pounds, $38; 16 and 20 pounds, $36; 25 to 40 pounds, $36. Track materials: Spikes 2.15c to 2.20c; track bolts, square heads, 2.05c; hexagon heads, 2.65c; fish plates, 1.60c on orders accompanying large rail contracts, otherwise 2c to 2.10c is asked.

Plates.—The market continues firm with a fair amount of business going, and the leading local interests with all the current business they can comfortably handle. The plate situation is entirely satisfactory from the point of view of the large local mills. They are getting the same prices as they realized last summer, and are in fact turning out a slightly larger tonnage, owing to various improvements. With the Eastern mills the situation is of course quite different, as the heavy premiums charged last year are absent now. We repeat quotations as follows: Tank plates, ¼-inch thick and up to 100 inches in width, 1.66c at mill, Pittsburg; flange and boiler steel, 1.75c; marine, ordinary firebox, A. B. M. A. specifications, 1.80c; still bottom steel, 1.80c; locomotive firebox, not less than 2.10c, and it ranges in price to 3c. Plates more than 100 inches, 5c extra 100 pounds. Plate 3-16-inch in thickness, $2 extra; gauges Nos. 7 and 8, $3 extra. These quotations are based on carload lots, with 5c extra a hundred pounds for less than carload lots. Terms, net cash, in 30 days.

Structural Material.—Local mills are watching the developments in New York with interest as a termination, or partial termination of the labor troubles there would make quite a difference in tonnage. A report that the American Bridge Co.'s contract for structural work in connection with the new railroad approaches to St. Louis had been canceled owing to the refusal so far of the local authorities to grant franchises is premature. Tonnage in structural material is fully up to the average and the mills are in good shape. We quote official prices unchanged as follows: Beams and channels, 3 to 15 inches, 1.60c; 18 to 24 inches, 1.70c; tees, 1.65c; zees, 1.60c; angles from 3 to 16 inches, 1.60c; universal mill plates, 1.60c.

Sheets.—The sheet market is quite firm, the leading producer being well filled up and the outside mills having all the tonnage they can handle with the supply of steel available. Galvanized sheets continue to be quoted in some quarters at slightly under the regular figures, but this does not extend to black. There is nothing new in corrugated sheets since the abrogation of the agreement between the leading interest and the so-called manufacturers' association. Regular prices are $2.10 a square for black and $3.35 a square for galvanized, 2½-inch corrugations, 28 gauge, in carloads to jobbers. These prices are pretty strictly maintained. Jobbers' stocks of sheets are rather low and the usual advances are obtained for small lots. We quote official prices on contracts for 500-bundle lots and over as follows: No. 28, 2.75c; No. 27, 2.65c; No. 26, 2.55c; Nos. 22 and 24, 2.45c; Nos. 18 and 20, 2.35c; Nos. 14 and 16, 2.25c; Nos. 10 and 12, 2.10c to 2.15c. Galvanized: No. 16, 2.60c; No. 18, 2.85c; No. 26, 3.35c; No. 27, 3.60c; No. 28, 3.85c; No. 29, 4.35c; No. 30, 4.50c.

Wire and Nails.—Trade in wire goods is unusually good for this season of the year. Here and there a slight shading in wire nails is reported, but in general the market is quite firm. We continue to quote: Wire nails, carload lots, to jobbers, f. o. b. cars, Pittsburg, $2; plain wire, carload lots, $1.90; barb wire, carload lots, $2.30; staples, carload lots, $2.20. Galvanizing, 30 cents extra. Carload lots to retailers are held at 5 cents advance in all lines, and on less than carload lots a further advance of 10 cents is charged. Steel cut nails are quoted as follows: Carload lots, $2.15, and less than carload lots, $2.20, f. o. b. Pittsburg, plus freight to point of destination. Iron cut nails are $2.25 in carload lots and $2.30 in less than carload lots. Terms, 60 days, less 2 percent off in 10 days.

Tin Plates.—The fire Saturday night at the Shenango tin mill, New Castle, of the American Tin Plate Co., disables for seven or eight weeks one train, or ten mills out of the 30 hot mills, and the cold rolling department. The cold rolling department at the Greer plant, adjoining, is being run nights, by which the product of the remaining 20 mills at the Shenango plant is being cold rolled, so that the fire simply decreases production by ten mills for a couple of months. The company has been running all its operative mills at full capacity right along, and has no reserve to draw upon. The Irondale plant has been idle for a short time on account of a broken engine shaft, but is about ready to resume. The company is sold up through August and is not taking new business except for September shipment, the independents getting premiums of from 20 to 25 cents a box for any shipments within four or five weeks. The McKeesport plant of 10 mills has been running very steadily since it was started, having had some good contracts for steel. The weather has been such as to throw back several crops, notably corn and tomatoes, while demand for other goods has been so great from jobbers, whose stocks are unusually low, that there has been great pressure on can factories nevertheless, while the belated crops will, in the opinion of the best judges, prolong the canning season this year far beyond its normal limits, and it will not be a surprise if the tin plate works are under some pressure until some time in October. The official price remains $3.80 for 100-pound cokes f. o. b. mill Pittsburg district on contract, while prompt mill lots are $4 to $4.05, and small lots from stock still higher.

Merchant Steel.—There is nothing new in this line, the condition being quiet as usual at this time. Prices remain as follows: Turned cold rolled and ground shafting, 47 off in carload lots and 42 percent off in less than carload lots. Tire steel, 2.15c to 2.25c; spring steel, 2.25c to 2.35c; toe calk, 2.30c to 2.40c. Tool steel is quoted 7 cents and upwards, according to the grade.

Spelter.—The market continues strong, and we quote spot and July, for shipment from the producing region, at 5.63½c, Pittsburg.

Old Material.—There is no market on scrap, quotations being practically nominal. The iron mills, which are about to shut down for summer repairs, are not interested in the market, and foundries are as poor buyers of scrap as of pig iron. It is reported a sale of crop ends was made at $20.50, while dealers quote ordinary melting stock at $20.

Coke.—The coke market seems a little firmer, and buyers are more discriminating, which puts coke usually called Connellsville, but not up to the strict standard, at a disadvantage. On strictly Connellsville furnace coke we now quote $3 on contract, various otehr brands being quoted around $2.75, while purely outside coke is lower. On strictly Connellsville 72-hour coke $3.75 to $4 is quoted, but $3.50 can be done on a nice contract, and outside coke is about $3.25. It is reported a large stack of coke will be accumulated at Duquesne in fear of another railroad blockade this fall. Production in the two Connellsville regions in the week ending June 20 was about 303,500 tons, or about the same as for a number of preceding weeks, but the upper Connellsville region fell behind, the lower making up the deficiency.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1115 MONADNOCK BLOCK, June 30.

There has been further buying of steel rails this week and from the activity of the present inquiry there is every reason to anticipate a continuance of the buying for at

least several weeks, or until the bulk of the requirements for 1904 are placed. There will be carried over into 1904 at least 400,000 tons of orders that were booked for 1903 shipment, so that there is practical assurance that the Western steel mills will have all the tonnage next year they can turn out. Fully 60 percent of their expected output for next year has been sold. It is now a question of keeping the buyers at a distance, for the bulk of the consumption being in the West and the delivered price for Western rails being below that for shipments from Eastern mills, it is a foregone conclusion, that all that remains for the Western mill owners is to allot the business. Meanwhile the Eastern mills continue to take a few orders for 1903 deliveries, late in the season. One of these orders this past week is for 3,500 tons.

Concerning the market for finished material, there is a sharp contrast between the mill and the store trade. The latter is active and improving; the former is dull. The bright spot is specifications, which are growing steadily all the while. But no one is buying ahead.

Pig Iron.—Every buyer is watching the big implement inquiry. When it is placed, there will be a multitude of orders following, but from present indications purchases will be desultory until that purchase is made. The purchasing agent is said to have visited other markets within the past few days and there have been at Chicago pig iron men from points as far distant as Philadelphia, making diligent inquiry concerning the big order, which may be 20,000 tons, but is just as likely ultimately to be 60,000 tons. But the fact is becoming more apparent that this order will not be placed unless there is a reduction in prices satisfactory to the buyer. In fact "satisfactory prices" is the keynote to the present situation. There are a few inquiries, ranging from 500 to 3,000 tons, and sometimes this notation is made in the inquiry: "This order will not be placed unless prices named are satisfactory." It now requires a lot of talking and haggling to sell even a carload of pig iron. But with all this unusually severe pressure from the buyers, prices have not made serious decline this week. Nothing is heard here by way of quotation better than the $14 Birmingham price, at which the Milwaukee order noted last week was placed. One sale of 200 tons of No. 2 Southern foundry was made at $14.75 for September and October delivery. One of 500 local iron at $19.50, for No. 2. There is an abundance of iron for spot shipment and the foundrymen as a rule have surplus iron in their yards. Prices are as follows:

Lake Superior charcoal	23 00 to 24 00
Local Coke Foundry No. 1	20 00 to 20 50
Local Coke Foundry No. 2	19 50 to 20 00
Local Coke Foundry No. 3	19 00 to 19 50
Local Scotch Foundry No. 1	20 00 to 20 50
Southern Coke No. 1	19 35 to 19 85
Southern Coke No. 2	18 85 to 19 35
Southern Coke No. 3	18 35 to 18 85
Southern Coke No. 4	17 85 to 18 35
Southern No. 1 soft	19 35 to 19 85
Southern No. 2 soft	18 85 to 19 35
Southern Gray Forge	17 60 to 18 10
Southern Silveries (4% to 5% silicon)	20 60 to 21 10
Southern Silveries (5% to 6% silicon)	20 85 to 21 35
Jackson Co. Silveries (6% to 8% silicon)	23 30 to 24 30
Jackson Co. Silveries (8% to 10% silicon)	24 30 to 25 30
Ohio Strong Softeners	21 50 to 22 00
Alabama and Georgia Car Wheel	26 35 to 27 35
Malleable Bessemer	19 50 to 20 00
Basic Iron	19 85 to 20 35

Bars.—A fair tonnage of steel bars has now been placed for the half year ending Jan. 1, 1904, and there are some orders that extend over the year, but the bulk of the buying remains to be made. So, too, with iron bars. Regarding steel, there seems no doubt about the stability of quotations. Iron is slowly declining. Small lots are readily bringing 1.75c for early delivery, but 1.70c is usually held to be the present market and it is said to have been shaded for desirable orders. Store trade is excellent, for consumption is not deficient. But there is little buying for future shipments. We quote mill shipments, Chicago delivery, Bessemer steel, 1.76½c; angles, less than 3x3, 1.86½c base; hoops in lots of 250 tons and greater, 2.06½c; less than this amount, 2.16½c; iron, 1.70c to 1.75c. Quotations from store, steel, 2c; iron, 2.10c; hoops, 2.40c to 2.50c; angles, 2.25c rates.

Sheets.—There is a steady store trade for sheets, with prices unchanged for black sheets. Nominally there is no change in galvanized but a better discount, an extra 2½ percent, is occasionally reported by the buyer. We quote mill shipments, carload lots, Chicago delivery, as follows: No. 27 black, 2.86½c to 2.91½c; No. 28, black, 2.96½c to 3.01½c. Galvanized 75 and 5 percent. On lots from store, we quote No. 27 black, 3c to 3.05c; No. 28 black, 3.10c to 3.15c. Galvanized, 75 percent to 75 and 2½ percent.

Structural Steel.—The contract was placed this past week for the Kimbark Building on Wabash Ave. The structure is to be larger than was at first contemplated—twelve stories of heavy construction—and 1,400 tons of steel will be required. Store trade is slightly better perhaps, but the general report concerning the market is that it is dull. We quote mill prices, Chicago delivery: Beams and channels, 16 inches and under, 1.75c; 18 inches and over, 1.85c; universal plates, 1.75c; angles, 3x3 and larger, 1.75c; tees, 3x3 and larger 1.80c; zees, 1.75c. Lots from store, 2¼c per pound.

Plates.—Nothing new has developed in plates, a brisk demand for early shipment from warehouse being the rule, mills remaining inactive, because of the impossibility of making deliveries. We quote mill prices, Chicago delivery, as follows: Tank steel, ¼ inch and heavier, 1.75c; flange steel, 1.85c. Prices for lots from stock: Tank steel, ¼ inch and heavier, 2.15c to 2.25c; 3-16, 2.25c to 2.35c; No. 8, 2.30c to 2.40c; No. 10, 2.35c to 2.45c; flange steel, 2.40c to 2.50c.

Rails and Track Supplies.—There has been during the past week a continuation of the large buying of standard sections for next year's shipments. There are large inquiries for spring shipment, which can not be filled entirely, distribution throughout the year being the essential basis of orders. A nice adjustment is required and the inquiries have been of a scale so generous that no doubt remains about the complete activity of Western mills throughout the coming year. There have been sales for 1903 shipment, aggregating 5,000 to 10,000 tons. Light rails also have been in good demand. We quote standard sections, 500 tons and over, $28; less than 500 tons to carload lots, $30; less than carload lots, $32; second quality rails, $27; light rails, 45 pounds, $34 to $35; 12 pounds, $39 to $40; regular differentials for intermediate sizes. Track supplies, mill shipments: Angle bars, 2c to 2.10c; spikes, first quality, 2.25c (out of store, carload lots, 2.35c to 2.45c rates); second quality, 2.10c; track bolts, 3½x¾, with square nuts, 2.85c to 3c per 100 pounds; with hexagon nuts, 3.05c to 3.15c, with usual differentials for other sizes.

Merchant Steel.—Merchant steel is at the point of most marked summer dullness and will probably so continue for several weeks. A fair buying for the new year is in progress. Prices are unchanged. We quote mill shipments, Chicago delivery, as follows: Spring steel, 2.65c to 2.75c; sleigh shoe, 1.95c flat sizes; concave and convex, 2c; out of store, 2.15c; cutter shoe, 2.50c to 2.60c; machinery steel, 2.15c to 2.25c base; plow steel, 2.50c and upwards, according to quality; toe calk, 2.30c to 2.40c; out of stock, 3c to 3.10c; ordinary tool steel, 6c to 7c; specials, 13c and upwards; less than carload lots, 5 and 10 percent higher; cold rolled shafting, carload lots, 47 percent off; less than carload lots, 42 percent off.

Merchant Pipe.—A continuance of satisfactory business in merchant pipe is reported. From all parts of the West jobbers are ordering, depending upon prompt shipments to supply their demand. We quote carload lots mill shipments, random lengths f. o. b. Chicago, as follows:

	Steel Pipe.		Guaranteed Wrought Iron Pipe.	
	Black. Percent.	Galv. Percent.	Black. Percent.	Galv. Percent.
⅛ to ⅜ in. inclusive	66.35	56.35	63.35	53.35
½ inch	68.35	58.35	65.35	55.35
¾ to 6 inches	73.35	63.35	71.85	61.85
7 to 12 inches, inclusive	67.35	57.35	64.35	54.35

Less than carload lots, 12½ percent advance over above prices.

Boiler Tubes.—Standard boiler tubes are still from six to eight weeks behind in deliveries, while special tubes are from two to three months behind. Demand is brisk and prices unchanged. Our quotations below are on car-

load lots, mill shipments, f. o. b. Chicago. On less than carload lots, 12½ percent is to be added:

	L. W. Steel Percent.	C. C. Iron Percent.
1 to 1½ in.	43.35	38.35
1¾ to 2½ in.	55.85	35.85
2¾ to 5 in.	60.85	45.85
6 to 13 in.	55.85	35.85

For lots direct from warehouse stock:

	L. W. Steel Percent.	C. C. Iron Percent.
1 to 1½ in.	40	35
1¾ to 2½ in.	50	22½
2¾ to 5 in.	57½	42½
6 to 13 in.	50	22½

Cast Iron Pipe.—There is steadiness to quotations and only a moderate demand for cast iron pipe. We quote on carload lots, f. o. b. Chicago, 4-inch water pipe, $33; 6-inch, $32; 8-inch and upwards, $31; gas pipe, $1 a ton higher.

Billets and Wire Rods.—One lot of 2,000 tons of high carbon Bessemer was sold at $30.75, Ohio mill. In strictly Chicago territory, business consists mainly of small lots for forging, the tonnage thus sold the past week aggregating about 500 tons or more. We quote German basic Bessemer billets, $28.50 to $29, seaboard; domestic Bessemer billets, $32.80; open-hearth billets for rolling mill use, $3.50 to $31; for forging purposes, $34 to $36; wire rods, $39.50 to $40.

Wire and Wire Nails.—Reports from a large number of wholesale hardware houses throughout the West are that the demand for barb wire this fall will be large and preliminary orders are being placed on that hypothesis. Just now the actual buying of wire by consumers is moderate, for the farmers are busy with other work. The nail trade is showing some slight improvement, due to a fading away of the strike troubles in many parts of the country. Quotations to jobbers, Chicago delivery, are as follows: Wire nails, carload lots, $2.20; less than carload lots, $2.30. Cut nails, steel, carload lots, $2.26½; less than carload lots, $2.36½. Plain wire, $2.10 carloads, and $2.20 in smaller lots; galvanized, carloads, $2.40; smaller lots, $2.50. Barbed wire, carloads, $2.50; less than carloads, $2.60; galvanized carloads, $2.80; less than carloads, $2.90; Staples, carloads, $2.30; smaller lots, $2.40; galvanized, carloads, $2.60; smaller lots, $2.70. Bale ties, 85 percent discount f. o. b. Waukegan on straight carload lots. Poultry netting, 85 and 5 percent discount from list f. o. b. Joliet or DeKalb, with actual freight allowed not exceeding 50 cents per 100 pounds.

Coke.—The coke market is heavy in tone. There is a lot of it offered here at concessions from previous prices. Consumers of all grades are becoming uncomfortably filled up with fuel, bought on what was supposed to be most favorable terms. Low sulphur West Virginia foundry coke has been offered in considerable lots as low as $2.50 at ovens, but Connellsville is quoted at about $3.25 or higher for contracts.

Old Material.—The downward trend of prices continues, though there has been some adjustment during the past few days. Some grades had fallen relatively too low and are getting into line again, but the pressure is to sell and the consumption is light. Rolling mill scrap especially is dull and weak. Many of the mills will close in a few days, some to remain idle for a number of weeks, so that the consumption of these grades will be even lighter than it has been. Cast scrap is selling fairly well but not in large lots. Some new inquiries for melting steel are appearing from the East.

Dealers' selling prices in gross tons follow:

Old iron rails	$21 50 to 22 00
Old steel rails (mixed lengths)	16 50 to 17 00
Old steel rails (long lengths)	19 50 to 20 00
Relaying rails	29 50 to 30 00
Old wheels	20 00 to 20 50
Heavy melting steel	15 50 to 16 50
Mixed country steel	12 50 to 13 50

The following are selling prices per net ton:

No. 1 R. R. wrought	$16 00 to 16 50
No. 2 R. R. wrought	14 50 to 15 00
Shafting	16 00 to 16 50
Dealers' forge No. 1	13 00 to 14 00
No. 1 busheling and wrought pipe	12 00 to 12 50
No. 1 cast	14 50 to 15 50
Heavy cast (300 pounds and over)	10 00 to 10 50
Country malleable	12 50 to 13 00
Iron axles	20 00 to 21 00
Steel axles	17 00 to 17 50
Cast borings	5 50 to 6 00
Mixed borings, etc.	5 50 to 6 00
Wrought turnings	12 00 to 12 50
Machine shop turnings	12 00 to 12 50
Iron axle turnings	12 50 to 13 00
Steel axle turnings	12 00 to 12 50
Stove plate and light cast scrap	9 00 to 9 50
Old iron splice bars	17 00 to 17 50

CLEVELAND.

OFFICE OF *The Iron Trade Review*,
1064 ROSE BUILDING, July 1.

Preliminary estimates are that the shipment of ore down the lakes was about the same in June as during the same month a year ago. The delays to the boats have been serious and are still so, but the larger tonnage and the faster movement of the dock machinery increase the amount of material moved without seeming to show any acceleration in the dispatch to boats. This week the lake market is a little easier, shippers being able to get more nearly the amount of tonnage demanded, but still being short of their desired supply. The conditions are favorable to the vessel interests although they have not been able to force an advance in the carrying charges. The rates on wild cargoes are: 80c from Duluth; 70c from Marquette; and 60c from Escanaba. Little is done in the way of ore sales. Prices do not change from a basis of $4 for Bessemer Mesabi and $4.50 for Bessemer old range.

Pig Iron.—The week has further emphasized the difference in the quotations of association and independent furnaces of the South on iron for second half. The association furnaces have been underbid by their outside competitors who have disposed of some material at $14 Birmingham, but on small lots $14.50 Birmingham has been done for No. 2. The Northern furnaces have made no sales of any importance for second half and there has not been enough inquiry of that sort to warrant a quotation. However, based on Southern prices, Northern furnacemen would be expected to quote $17.75 to $18.25 for No. 2 in the valleys. Sales have been mostly in carload lots or in 100-ton lots at the outside. Some stacks have been running on malleable which is bringing a good price. Production is heavy, as the furnaces are meeting with few drawbacks, the supply of coke being adequate for all needs. Bessemer and basic iron have been dull and the market easy. We continue to quote, f. o. b. Cleveland, with the exception of gray forge, which is quoted at Valley furnace:

Bessemer	$19 35 to 19 85
No. 1 Strong Foundry	19 35 to 19 85
No. 2 Strong Foundry	18 60 to 19 10
No. 3 Foundry	18 35 to 18 60
Scotch No. 1	19 35 to 19 85
Scotch No. 2	18 60 to 19 10
Gray Forge, Valley furnace	18 00 to 18 25
Lake Superior charcoal	23 00 to 24 00

Finished Material.—The better conditions in the plate trade noted a week ago have brought out so much business that the larger mills are now unable to make deliveries inside of four weeks. Other mills have not been filled up so completely but they still prefer the spot trade at good prices to contracts at association prices. Buying of structural has been heavier and specifications against contracts have improved. Conditions as to deliveries, however, have not changed, smaller angles and larger beams being still easy to obtain, with some intermediate grades scarce. Jobbers are getting some business at 2.15c. The independent bar mills and those of the Republic Iron & Steel Co. will close on Friday night for the midsummer repairs. Buying of late has been rather light and the market weak especially in bar iron where some mills have been selling on the basis of Bessemer steel, 1.70c Cleveland, which quotation, however, is not being met by the larger mills. The prices are: 1.60c Pittsburg for Bessemer steel; 1.70c Pittsburg for open hearth; and 1.70c to 1.80c Cleveland for bar iron. Electric line inquiry for steel rails has been good and the general rail market brisk on business for 1904. The steam railroads of this territory are mostly ordering though their general offices in the East, and the understanding is that the Lake Shore has closed for a large tonnage in rails. There have been some sales of billets lately both by the steel corporation and by concerns outside, and at a lower price than recently quoted. Competitive business is expected presently

with a considerably lower price than has recently been asked. No local transactions, however, have been reported, although it is understood some sales have been made below $30 for Bessemer Pittsburg. The report of cuts in sheet prices by the independent mills has been persistent with little effect as yet upon the general quotation in this territory. The jobbers, through whom most of the transactions have been made, report the following prices, as unchanged from last week: Galvanized sheets, mill sales, carload lots, Nos. 10 and 11, 2.60c; Nos. 12-14, 2.70c; Nos. 18 to 21, 3c; Nos. 22 to 24, 3.20c; Nos. 25 and 26, 3.55c; No. 27, 3.80c; No. 28, 4.05c; No. 29, 4.45c; No. 30, 4.95c. Galvanized sheets out of stock are quoted 75 and 5 off. For 3-16-inch black sheets and heavier we quote 2.15c, Cleveland. Mill sales of black sheets to consumers are made on the following basis: No. 24, 2.65c to 2.75c; No. 26, 2.75c to 2.85c; No. 27, 2.85c to 2.95c. The following are prices out of stock: No. 10, 2.35c to 2.50c; No. 12, 2.45c to 2.60c; No. 14, 2.50c to 2.60c; No. 16, 2.60c to 2.70c; Nos. 18-20, 2.75c to 2.85c; Nos. 22-24, 2.85c to 2.95c; Nos. 25-26, 2.95c to 3.05c; No. 27, 3.05c to 3.15c; No. 28, 3.15c to 3.25c.

Old Material.—The market is still practically without sales except those which are made among the dealers. The market from dealers to consumers is very uncertain, introducing much of an element of guess into the quotations made. Lower prices, however, are warranted by the reduction in the price of pig iron. Some inquiry for steel melting stock is noted. We continue to quote f. o. b. Cleveland, all gross tons:

Old iron rails	22 00 to 22 50
Old steel rails (over 6 feet)	20 50 to 21 00
Old steel rails (6 feet and under)	19 00 to 20 00
Old car wheels	21 00 to 22 00
No. 1 R. R. wrought scrap	20 00 to 21 00
Mill scrap	16 00 to 17 00
No. 1 machine cast scrap	18 00 to 18 50
Iron axles	25 00 to 26 00
Steel axles	25 00 to 26 00
Axle turnings	15 00 to 16 00
Wrought turnings (free from cast)	14 00 to 15 00
Cast borings	9 00 to 9 50
Uncut wrought iron boilers	11 00 to 12 00
Steel boiler plates	16 00 to 17 00
Grate bars	13 00 to 14 00
Pipes and flues (clean)	16 00 to 17 00
Tank iron	16 00 to 17 00
Hoop and band iron	13 50 to 14 50
Sheet iron	12 00 to 13 00
Wrought drillings	14 00 to 15 00
Malleable iron (railroad)	19 00 to 20 00
Malleable iron (agricultural)	16 00 to 16 50
Stove plate	13 00 to 14 00
Heavy steel	18 00 to 19 00

CINCINNATI.

June 30.

In some quarters the coke situation is regarded as firmer this week but $3.50 f. o. b. ovens for 72-hour foundry coke is still freely quoted although we hear of a few sales at $3.75. The business is mainly for small lots and on any large business lower prices can be obtained. Trade is rather quiet in coke and orders are not large.

Pig Iron.—The market has drifted to a lower level the past week. Just what could be done on any good sized order for delivery, over the second half is difficult to state. That $13.50 Birmingham for No. 2 foundry could be done is known and $13.25 is belived to be not a remote impossibility. The general market for the small lot business offering is down to $13.75 Birmingham for No. 2 foundry as an inside price. The Northern furnaces are competing for business, and $16.50 for No. 2 foundry at Southern Ohio furnaces has become almost an open figure. We hear of $12 Birmingham for gray forge and mottled. While, of course, the above figures are the inside prices, and do not cover the bulk of the business, they serve to show the trend of the market and make it clear that furnaces, North and South, are not content to pile iron and wait the buyers' pleasure to come into the market. Buyers are holding off and even what seem promising inquiries for fairly good sized lots, shrink to smaller proportions when the order is placed. An Ohio pipe foundry inquiry for from 3,000 to 6,000 tons resulted in a purchase of 1,000 tons of No. 3 and No. 4 foundry, 500 tons each at $16.25, delivered. The iron was sold to come from a Northern furnace. The prospective purchase of a large consumer in Chicago is being watched with considerable interest and sales agents are indulging in various expressions as to what figure will take the order. The association furnaces have made no change of front and still maintain that the basis established a month ago will be adhered to, in spite of the fact that the market has declined and the schedule is no longer even a target. Sales agents no longer assert with confidence that the time is now ripe for the buyer to cover for the second half. It is generally believed that melters will run along from hand to mouth, and it is no doubt a fact that users of pig iron are holding off until the last moment before ordering anything. At this time we can notice only a slight improvement in the small lot order business. The market this week has a decidedly weak appearance and the situation is very much in buyers' favor. We quote the market for delivery f. o. b. Cincinnati:

Southern Foundry No. 1	$17 50 to 18 00
Southern Foundry No. 2	17 00 to 17 50
Southern Foundry No. 3	16 50 to 16 75
Southern Foundry No. 4	16 00 to 16 50
Southern Foundry No. 1 soft	17 50 to 18 00
Southern Foundry No. 2 soft	17 00 to 17 50
Gray Forge	15 25 to 17 75
Northern Foundry No. 1	18 15 to 18 65
Northern Foundry No. 2	17 65 to 18 00
Southern car wheel iron	26 25 to 27 25

Finished Material.—An easy tone prevails and the market is quiet. Buyers are taking only enough to cover current needs and the decline in pig iron is made the basis for complaint when schedule prices are asked. Bar iron is obtainable at the steel base price in car lots and any large business offering brings out lower quotations. Iron bar, car lots, are quoted at $1.73 to $1.75 base, half extras. Steel bars remain at 1.73c base, half extras, with the retail price 2c base, half extras, for both out of store. Galvanized sheets are being quoted at 75 and 5 percent off. We quote black sheets No. 27 at 2.78c in car lots of 500 bundles. Black sheets out of store are selling as follows: No. 28, 3.10c; No. 27, 3.20c; No. 16, 2.65c; No. 14, 2.55c; No. 12, 2.45c; No. 10, 2.35c. Tank plates are firm and sell out of store at 2.15c for ¼-inch and 2.25c for 3-16-inch. Beams and channels are quoted at 2.15c to 2.25c from stock, and angles at 2.15c to 2.25c for base sizes. The merchant pipe market holds steady and unchanged with a firm tone prevailing. We quote:

MERCHANT PIPE.

(Basing Discounts.)

	Steel Pipe. Black. Percent.	Steel Pipe. Galv. Percent.	Guaranteed Wrought Iron Pipe. Black. Percent.	Guaranteed Wrought Iron Pipe. Galv. Percent.
⅛, ¼, ⅜ inch	66.7	56.7	63.7	53.7
½ inch	68.7	58.7	65.7	55.7
¾ to 6 inch, inclusive	73.7	63.7	70.7	60.7
7 to 12 inch, inclusive	67.7	57.7	64.7	54.7

BOILER TUBES.

	Steel Percent.	Iron Percent.
1 to 1¼ inch	41.2	35.2
1¼ to 2½ inch	54.2	34.2
2¾ to 5 inch	50.7	44.2
6 to 13 inch	54.2	34.2

Old Material.—Prices show no change and the market remains dull and inactive with quotations largely nominal. We quote:

Old No. 1 railroad wrought, net tons	$14 00 to 15 00
Cast machine and foundry, net tons	12 00 to 13 00
Old iron rails, gross tons	17 00 to 18 00
Old steel rails, gross tons	15 00 to 16 00
Old short lengths, gross tons	15 00 to 16 00
Old iron axles, net tons	18 00 to 19 00
Stove plate, net tons	6 00 to 7 00
Wrought turnings, net tons	8 00 to 9 00
Cast borings, net tons	5 00 to 6 00

NEW YORK.

OFFICE OF *The Iron Trade Review*,
ROOM 1909, NO. 150 NASSAU ST., June 30.

Pig Iron.—The continued absence of buyers from the market was responsible for a slight recession in prices during the past week. There is a tendency in some quarters to palliate this fact by the statement that reduced values are due solely to re-sales, but it is pointed out that even if this argument is given its fullest force, it shows that the sellers expect a still weaker situation to develop later on. The truth is that many of the sales were entirely

new business. It is stoutly insisted that the associated furnaces are not receding from scheduled prices; but whatever the amount of iron sold on analysis and not by grade, by such furnaces, it is a fact that lower prices are being steadily made by furnaces that are doing business. Furnacemen do not get much light on the question of what minimum consumers would entertain. Some estimates go as low as $12 for No. 2 Southern foundry, Birmingham, but producers say this is out of the question; that the furnaces that would go out of blast on such a basis would sharply curtail output. Northern irons are lower, and it is said that some furnaces are willing to close contracts for delivery here for Northern No. 2 for the next six months at $18. It is claimed that some orders have recently been accepted at $18.50. Advices are to the effect that deliveries on old contracts of foreign irons are almost exhausted. If this is so it will make the domestic situation still more interesting. New York prices are as follows: Northern No. 1 X, $19.50 to $20; No. 2 X, $18.50 to $19; No. 2 plain, $18 to $18.50; Southern No. 1 foundry, $19.25 to $19.50; No. 2 foundry, $18.75 to $19; No. 3 foundry, $18 to $18.50; No. 4 foundry, $17.75 to $18.

Billets.—Conditions remain unchanged, but for October delivery German basic billets can be had at $27.50, New York delivery, duty paid.

Finished Iron and Steel.—On the whole, the finished iron market was a little firmer during the past week, although all departments are still suffering from disturbances in the labor world, particularly here. The general business of the American Bridge Co. is slightly better, notable contracts closed during the past week including 6,500 tons for the General Electric Co., Schenectady, N. Y., and 3,200 tons for a warehouse in Buffalo, N. Y. In bars large lots have been selling at lower prices, but the small jobbing trade is fairly firm. Sheets are holding their own, chiefly because independent interests have the problem of steel supply still on their hands. In plates the volume of new orders is not so great, and deliveries are better than they have been in some time. New York prices are as follows: Beams and channels, 15 inches and under, 1.75c to 1.90c; angles, 3 to 6 inches, 1.75c to 1.90c; zees, 1.75c to 1.90c; bulb angles, 2.05c to 2.35c; deck beams, 2.05c to 2.25c; sheared steel plates, tank, 2.10c to 2.15c; flange, 2.25c to 2.30c; firebox, 2.30c to 2.50c; refined iron bars, 1.85c to 2c; soft steel bars, 1.75c to 1.85c; steel sheets, in carloads, New York, No. 28, black, 2.90c to 3.05c; galvanized 75 and 2½ off.

BIRMINGHAM, ALA.

June 30.

The manufacturers of pig iron in Alabama have been giving their undivided attention the past week to the question of arriving at a new wage scale with the coal miners to run one year from July 1, 1903. Up to this writing no agreement has been reached, and the indications are now that it may be some days before an agreement will be signed up. The operators submitted to the miners on Friday last a proposition to grant an increase of 2½ cents per ton, or rather increase the maximum and minimum figures under the present sliding scale 2½ cents, with corresponding increase to the day labor. In submitting this proposition to the joint convention of miners and operators, it was stated it was the operators' ultimatum. It has been referred back to the local lodges and will be voted on by the rank and file of the unions today and tomorrow, the result to be reported to the joint convention tomorrow afternoon. The miners reduced their demands 2½ cents, leaving a difference of only 2½ cents between them and the operators on the question of wages; but it is understood that the eight-hour day and two weeks' pay day will be demanded and the proposition of the operators rejected. Preparations are being made for a suspension of ten days or two weeks.

Very few sales of pig iron are reported, and the iron market is in about the same condition that has prevailed for some weeks.

The stack of the Alabama Consolidated Coal & Iron Co., at Gadsden, was put out of commission on the morning of the 24th inst., in order to make connection with the new and larger stack recently built. It is expected that the steam lines will all be completed and the furnace ready to be blown in by the last week in July, provided a new wage scale is agreed upon with the miners, to insure supply of coke.

The large stack of the Central Iron & Coal Co., at Holton, near Tuscaloosa, Ala., is nearing completion, and the owners expect to put it in blast the coming month. It will be some weeks yet before the furnace of the Alabama Steel & Wire Co., now being erected at Gasden, will be ready for blast. This company, it is understood, is arranging with the Tennessee Coal, Iron & Railroad Co. for a supply of steel for its wire and rod mill at Ensley until it can put in operation its own steel mill at Gadsden.

It is reported that the Southern Car & Foundry Co. has sold its charcoal furnace at Gadsden, but the name of the purchaser has not been announced. It is understood that irregular supply of fuel and ores has prevented as successful operation of this plant as was hoped for.

The Metal Market.

NEW YORK.

OFFICE OF *The Iron Trade Review*,
ROOM 1909, NO. 150 NASSAU ST., June 30.

Pig Tin.—Prices are unchanged from those quoted in our last report, but the market has displayed symptoms of weakness, particularly in futures, which are lower, and in which very little interest is shown. Consumption is on a reduced scale, deliveries for June on that account amounting to 3,200 tons, which is a falling off of at least 1,000 tons by way of comparison with May. The canning industry was expected to furnish some good orders, but the results so far have been disappointing. The London market was slightly stronger during the week. The closing prices at the Metal Exchange today were as follows: Spot to July, $28 to $28.20. London closed today as follows: Spot, £127 12s 6d; futures, £124 15s. Arrivals at Atlantic ports for June amount to 3,455 tons with 2,610 tons afloat.

Copper.—The market has been dominated by extreme dullness, with prices being slashed in the open market. While the official quotations at the close of today's business continued at 14½c for lake and electrolytic and 14c for casting, the fact is that large offerings of the two first grades have been made at 14c without takers, and an offering of 100,000 tons of casting at 13¾c was allowed to pass unnoticed. The belief is that lower prices are imminent, and a leading interest is expected to promulgate a schedule to that effect any day. Buyers are awaiting developments, and are not in the market in consequence. The London market has been irregular, with prices little stronger, spot closing today at £58 and futures at £57 15s. Exports for June aggregated 7,078 tons, against 12,422 tons for a similar period last year.

Lead.—Unchanged here at 4.12½c for carload lots. St. Louis is 3.95c to 4c, and London £11 15s.

Spelter.—Is very scarce, and prices have advanced to 6⅛c to 6¼c for spot. St. Louis remains at 5.55c for spot, while London is stronger at £20 2s 6d.

Antimony.—Cookson's is 7½c; Hallet's is 6¾c, and other brands are 6½c.

Quicksilver.—Still quoted at $47.50 per flask of 76½ pounds in lots of 100 flasks. London unchanged at £8 2s 6d.

Nickel.—Is selling at 40c to 47c for large lots down to a ton, and 50c to 60c for smaller quantities.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1115 MONADNOCK BLOCK, June 30.

Buying of copper during the past week has been restricted. Large consumers are specifying on their contracts freely and are evidently consuming heavily, but they are not interested in buying far into the future. There is a steady trade in lead, and spelter is in excellent demand. Quotations are as follows: Lake copper, carload lots, Chicago delivery, 14½c to 14⅝c; smaller quantities, 14⅞c to 15c. Pig tin, 30c; pig lead, 4.30c in 50 to 100-ton lots, and 5¾c to 6c in lesser quantities; spelter, 5½c in carload lots, and 5¾c to 6c in lesser quantities; sheet zinc, 6¾c; antimony, 10¾c to 11c for Cookson's, and 9¾c for Hallett's. We quote old metals as follows: Copper wire, 12¼c; heavy copper, 12c; light copper, 11½c; heavy red brass, 12c; heavy yellow brass, 9c; light brass, 8c.

THE IRON TRADE REVIEW

Devoted to the Machinery, Metal-Working and Foundry Trades, and Iron and Steel Manufacture.

PUBLISHED EVERY THURSDAY BY

THE IRON & STEEL PRESS CO.

ROSE BUILDING, CLEVELAND, OHIO.

G. H. GARDNER, President and Treasurer,
JOHN A. PENTON, Vice-President,
A. I. FINDLEY, Secretary.

A. I. FINDLEY, - - - - - - - EDITOR.
ROBERT I. CLEGG, - - EDITOR MACHINERY DEPARTMENT.
GEORGE SMART, - - - - - ASSOCIATE EDITOR.

CHICAGO: 1115 Monadnock Block, GEO. H. GRIFFITHS, Manager.
PITTSBURG: 429 Park Building, A. O. BACKERT, Manager.
NEW YORK: 150 Nassau St., D. C. WARREN, Manager.
THE CENTRAL WEST: R. A. EVANS, Manager.

Subscription, $3.00 per annum. To Foreign Countries, $4.00.
Advertising Rates Furnished on Application.

The Cleveland News Co. will supply the trade with THE IRON TRADE REVIEW through the regular channels of the American News Co.

ENTERED AT THE POST OFFICE AT CLEVELAND, O., AS SECOND CLASS MATTER.

JULY 2, 1903

INCREASED IRON AND STEEL IMPORTS.

In May of last year, the import movement of pig iron had gained considerable headway, having increased from 7,633 tons in January to 30,708 tons in May. This year the imports for May, as shown by the report of the Treasury Department, indicate a marked cessation as compared with April. It is not probable that the figures will soon be higher, as present conditions do not favor imports. The decrease in imports of steel is not so marked. The imports of iron and steel for the first four months of 1902 and 1903 were as follows in gross tons:

	1902.		1903.	
	Pig Iron.	Steel.	Pig Iron.	Steel.
January	7,633	5,312	110,679	38,691
February	8,307	2,235	45,187	20,151
March	17,184	6,570	59,628	31,464
April	19,067	11,986	99,944	29,014
May	30,708	24,383	57,139	26,380
	82,899	50,486	372,577	145,700

The following table gives the imports for May and for the eleven months ending with May:

IMPORTS OF IRON AND STEEL TO THE UNITED STATES—GROSS TONS.

	May.		11 mos. end'g May.	
	1902.	1903.	1902.	1903.
Pig iron	30,708	56,139	126,503	882,353
Scrap	11,768	11,025	36,428	118,267
Bar iron	1,195	2,147	21,306	38,928
Iron and steel rails	5,151	7,701	9,086	111,968
Hoop, band or scroll	5	12	3,692	1,407
Steel ingots, slabs, billets or bars	24,383	26,389	54,839	348,973
Sheets and plates	196	772	7,222	7,011
Tin and terne plates	6,380	2,444	83,020	45,198
Wire rods	2,174	1,673	10,356	21,026
Wire and wire articles	274	463	3,930	3,448
Total	82,239	108,765	356,382	1,578,579

The total value of iron and steel imports for May, not including ore, but including some manufactures of iron and steel not named in the above table, is $3,679,821 against $3,263,361 for May, 1902. For the ten months, the totals are: 1903, $47,012,535; 1902, $23,544,317. For the ten months, the ore imports were 910,593 tons in 1902 and 1,097,776 tons in 1903. For May the imports of ore were 89,779 tons in 1902 and 153,558 tons in 1903.

The tonnage of exports is not quite as large as that of the preceding months, being 24,690 tons against 32,676 and about the same as for March. For the month, the value of exports, not including ore, but including manufactured articles not named in the table, was $8,330,063 against $8,392,108 in May last year. There was a marked decrease in exports of wire rods, those for April being 5,612 tons and those for May being 936 tons. The following table gives the exports for the articles named:

EXPORTS OF IRON AND STEEL FROM THE UNITED STATES—GROSS TONS.

	May.		11 mos. end'g May	
	1902.	1903.	1902.	1903.
Pig iron	1,673	822	52,613	16,545
Scrap	784	393	12,697	5,443
Bar iron	3,334	2,021	14,494	15,537
Wire rods	2,741	936	10,766	28,686
Steel bars (not wire rods)	649	1,318	15,010	12,331
Iron rails		20	632	81
Steel rails	8,031	295	159,309	22,054
Billets, ingots and blooms	303	57	2,801	2,097
Hoop, band and scroll iron	151	112	1,564	1,537
Iron sheets and plates	259	309	3,983	2,673
Steel sheets and plates	2,264	1,678	10,874	13,028
Tin plates, terne plates and taggers' tin	133	7	719	681
Structural material	3,530	2,881	59,406	29,859
Wire	11,010	9,744	90,704	91,015
Cut nails	1,190	677	6,389	6,369
Wire nails	2,805	3,159	17,985	26,028
Other nails, including tacks	128	261	1,727	2,272
Total	38,986	24,690	461,673	276,226

W. E. COREY ASSISTANT TO PRESIDENT SCHWAB.

Official announcement was made at New York, June 30, by Richard Trimble, secretary of the finance committee of the United States Steel Corporation, as follows:

"In consequence of the continued ill health of the president, he has requested the appointment of an assistant to perform the active duties of the presidency, and at today's meeting of the finance committee Mr. W. E. Corey, president of the Carnegie Steel Co., was appointed to such position."

William Ellis Corey is president of the Carnegie Steel Co., the National Steel Co. and the American Steel Hoop Co. He has been connected with the steel industry since his sixteenth year. His first position was in the laboratory of the Edgar Thomson Steel Works. While still engaged in the laboratory he studied bookkeeping and devoted his evenings at home to

the study of chemistry. He later entered the order department of the Carnegie works at Homestead and in time became manager there. By successive advances he became president of the company, succeeding Mr. Schwab on the formation of the United States Steel Corporation. His selection to the position of assistant to the president of the corporation is another expression of the maintenance of the Carnegie principle of the premiership of the operating department men, and seems to place him in line for the presidency of the corporation. He has shown ability of the highest type in the handling of the important interests committed to him in the past two years, and the announcement just made will tend to increase the confidence that has always existed in the operating end of the steel corporation's organization.

No intimation is given as yet of the changes Mr. Corey's promotion will bring in the Carnegie organization at Pittsburg.

The Labor Situation.

PART SETTLEMENT OF NEW YORK BUILDING STRIKE.

NEW YORK, June 30.—The unions in the building trades settled yesterday with the Geo. A. Fuller Co. and the tie-up is at an end so far as that firm is concerned. The plan provides for a committee, which shall act as a jury in all disputes. No mention is made of walking delegates. The committee must be composed of men who are in no way connected with labor unions or interested in the Fuller Co. In case the committee fails to agree on terms for settling a dispute, the members must elect an umpire, whose decision shall be final and binding on both parties to the agreement. The Geo. A. Fuller Co. employ about 30 percent of the men in the local field on its building operations.

Members of the Building Trades Employers' Association were not inclined today to discuss the independent action taken by the Fuller Co. with the unions, except to stay that it would not influence them to diverge from their own plan of arbitration, which aims at curtailing the power of the walking delegate.

EIGHT-HOUR MOVEMENT OF MACHINISTS.

Having secured the nine hour day in a majority of machine shops throughout the country, the machinists have begun a general fight for an eight hour work day. Twenty machinists walked out of the shop of the Inland Steel Co., Indiana Harbor, a few days ago, and say they will not return to work unless they are given the eight hour day without a reduction in pay. Officials of the union say that this is the beginning of a contest that will involve every plant in the country as fast as the existing wage agreements expire. The nine-hour day was secured after many strikes and heavy losses to employers and employes, and it is probable that before the work day is reduced by another hour, there will be disastrous industrial disturbance.

PITTSBURG MOLDERS' DEMAND.

(Special Telegram.)

PITTSBURG, July 1.—A mass meeting of molders in the Pittsburg district is called for Wednesday night of this week to consider whether they shall recede from their position of demanding a minimum wage rate of $3.30 a day, as against $3 now being paid, with 30 cents a day advance for all men receiving more than the minimum at present, and accept the terms offered by the employers, involving an advance of 10 cents all along the line. The conference between the employers and employes terminated Friday night last with the matter in this shape. This was attended by Joseph F. Valentine, first vice president, and J. H. O'Neil, business agent for central territory, and J. H. Fitzsimmons, of Pittsburg. The foundrymen were represented by Joseph A. Stone, of Cleveland; Geo. Mesta, of Pittsburg, and John A. Penton, commissioner of the National Founders' Association. The foundrymen's concession did not involve any change in the minimum. There is a prospect that the matter will be amicably adjusted.

PHILADELPHIA FOUNDERS REFUSE ADVANCE.

(Special Telegram.)

PHILADELPHIA, July 1.—The molders of this city are still at work. The conference held here last week adjourned without reaching an agreement, except that the New York agreement as to the continuance of work should be observed. The molders asked a reduction from 10 hours to nine hours and an advance of 10 percent. The matter is now in the hands of the national authorities in both the Iron Molders' Union and the National Founders' Association, and further conference will be held as hereafter agreed upon.

LABOR NOTES.

Last week there was a rush of employes of the Hecla Iron Works, Brooklyn, N. Y., to obtain employment, and a large number of the strikers have been taken back. It is understood that the profit sharing plans of the company will be abandoned as a result of the strike.

The strike of brass workers employed by the United Brass Co., Cleveland, has been settled, and about 100 strikers have returned to work. When the strike started, about six weeks ago, in several concerns, more than 500 men went out on a strike. All but one have been settled and less than 75 men are now out.

Samuel Parks, who is charged with extorting money from the Hecla Iron Works and other concerns in connection with the settlement of strikes, has been re-elected as one of the four walking delegates of the Housesmiths' and Bridgemen's union. He received the second largest vote polled in the balloting for delegates.

The Youngstown Iron Sheet & Tube Co. has signed the general scale presented by the Amalgamated Association of Iron, Steel and Tin Workers. The scale was signed by James A. Campbell, general manager, representing the company. The general scale signed does not include the special scales for the improved mills. When the mill resumes operations after the inventory is taken the first of July negotiations will at once be opened for the disposal of the special scale features.

The strike of the molders of Springfield, O., which has been in progress for a number of weeks, has been settled, concessions having been made on both sides.

The Employers' Association, Kansas City, Mo., including most of the business men of that city, has started a movement in favor of the repeal of all city ordinances that discriminate between union and independent labor.

The 125 boiler makers employed by the Titusville Iron Co., Titusville, Pa., are locked out and notices of an indefinite shutdown have been posted. The men were about to go on a strike when the lockout was ordered.

The strike of molders at Ironton Foundry, Ironton, O., was settled last week, the men returning under the same conditions that existed before they went out.

The labor trouble at the Hecla Iron & Mining Co. plant at Hecla, O., in the Hanging Rock district, was settled June 27 at a conference between the local union, the company officials and National President McMahon, of the Blast Furnace Workers of America. Both sides agreed to abide by the decision of a board of arbitration to be selected jointly.

There is strong talk of the manufacturers of the Hanging Rock section of the Ohio Valley organizing an association to work in harmony on the settlement of the numerous labor disputes and strikes now paralyzing industry in that section. One manufacturer states that he will make an effort to organize independent workmen on lines adopted in New York and Indiana.

Personal.

J. E. Springer, superintendent of the plant of the Aetna-Standard Sheet Steel Co., Martins Ferry, O., has tendered his resignation.

G. W. Lee Vey, heretofore superintendent and manager of the Blymyer Iron Works, Cincinnati, has become manager of the Cureton Foundry Co., Mt. Vernon, O.

H. W. Bundy, superintendent of the plant of the Springfield Drop Forging Co., Springfield, Mass., has resigned.

Wm. H. Crehan, superintendent of the pipe mills of the Youngstown Iron Sheet & Tube Co., has resigned his position. He will be succeeded by Henry Doyle, who for 15 years has been with the Spang-Chalfant & Co., of Pittsburg.

S. K. Hine has been appointed manager of the Girard Iron Co., Girard, O., to succeed the late J. A. Kennedy.

Austin Farrell, manager of the Gladstone and Marquette furnaces of the Cleveland-Cliffs Iron Co., has been appointed member for the upper peninsula, on the Michigan commission for the St. Louis Exposition.

Oscar Textor, chemist and metallurgist, delivered a lecture on June 29, on the manufacture and properties of iron and steel, before the Young Men's Club of Epworth Memorial church, Cleveland, and had in his audience of 150 many of the young men connected with iron and steel working establishments in the Cleveland district.

The American Steel Package Co., Defiance, O., advises us that it does not intend to move its plant from Defiance to Pittsburg as reported in local newspapers.

Philadelphia Machinery Market.

PHILADELPHIA, June 30.—The machinery market is flat, very flat. The condition is not so apparent as far as work going through the shops is concerned, for there is plenty of work in hand everywhere. But the end of it is in sight, and there is little or nothing coming in to insure the same activity for the summer and early fall months. Orders have fallen off to an appreciable extent, and the business booked during June shows rather a sad comparison with that of preceding months. The condition of the market, however, is anything but unexpected. First, because in normal times the midsummer weeks are usually somewhat unproductive; and, second, the disquietude in trade union circles has caused manufacturers to brush aside proffered orders, as their estimates would be unsafe and a loss more than probable. The writer has had many instances brought to his notice within the past month where possible orders for machinery of massive character have been positively discouraged in view of the existing situation. Nobody wants to lose money, and builders are guarding their order books accordingly. With a line thus drawn it is small wonder that the volume of trade has largely decreased.

The situation is saddled somewhat by the middlemen. Most of the business offering is coming from dealers and is obviously to cover stock requirements. Orders from this source cover mostly small machines, and are very acceptable to most builders, inasmuch as they are filled from a general run of work, and little or no risk is taken on them, at least as far as progress through the shops is concerned. The middleman has of late largely dropped out of transactions covering deals of magnitude, and concerns catering particularly to direct buyers notice the changed conditions of trade more than those whose output goes through regular trade channels.

While the market is somewhat discouraging at present, there is confidence that all disturbing factors will disappear before the fall, and that there will be a general resumption on a sound basis. In some shops advantage is being taken of the present time to make repairs and changes, and there is an air of enforced idleness about them.

There is no improvement in the demand from abroad, and foreign inquiry is very light. This condition is not so much due to the absence of foreign interests as to the want of effort on the part of our manufacturers to secure export trade. With the heavy home demand which has been in existence for such a long period little thought has been given to outside trade.

Raw materials are in somewhat better supply, and the relief is very evident in shops where much work has been hung up for the want of material to finish it. There is still a difficulty experienced in getting steel castings in anything like good time.

Collections are very fair, although promptness seems to be a quality very largely on the side of large concerns. Small buyers, with some exceptions of course, are not meeting their obligations as readily as earlier in the year. No great importance, however, attaches to this feature, nor is it likely to become a factor until after July is passed.

A good deal of business has come into the Philadelphia shipyards in the past few weeks, and there is every prospect of continued activity.

At the Baldwin Locomotive Works the order books are loaded up and there will be plenty of work for the 15,000 hands employed there for some time to come. The output of the plant is averaging five locomotives per day put on the rails for steam, an output which would be increased if it were possible with present facilities.

The Wilbraham Green Blower Co. is very busy at its works, and has a great deal of business in hand covering pressure blowers and exhausters, quite a little of it from foreign sources.

Israel H. Johnson, Jr., Co., builders of lathes, made a number of good shipments during the month, mostly lathes up to 24 inches and of a standard character. Among the larger tools shipped was a 42-inch special lathe, with 30-foot bed and weighing about 40,000 pounds, for the Reading Iron Co., Reading, Pa.

The Newton Machine Tool Works had the largest month's business, in point of shipments, of any time in their history. While the shipments were mainly regular lines of tools, one or two more than ordinarily large tools were sent away, including a vertical milling machine to the American Locomotive Works, Schenectady, N. Y., weighing 60,000 pounds. A duplicate of this machine is in course of construction for the Canadian Locomotive Works, Montreal. Orders taken during the month include one for cold saws and boring mills for the Lehigh Valley Railroad Co., and orders for a number of tools, including vertical millers and slotters, for the different plants of the American Locomotive Works.

The Hess Machine Co., builder of file making machinery, has a good deal of business in hand, the month bringing some nice orders from foreign points.

The Turner Machine Co., builder of molding machines, and machines for grinding cocks, and other ground key work, says business is quite good. This company shipped last week a large cock grinder to a firm in London, England.

The Keystone Machine Works say that business continues good with them, and that they expect to be busy for some time. They have lately received some nice orders for slotters and horizontal boring machines.

The Quaker City Electric Co. reports a great deal of business in hand at its works, and while the business booked for the month was of an ordinary character it made up a large aggregate. Latterly its business has been largely in installations of electric power transmission equipment, electric lighting, which formerly was almost its whole business, now only forming about one-fifth of it.

Thos. H. Dallett & Co. say that business continues good with them, although June was not so good as previous months so far as new business was concerned. Inquiries are quite plentiful and show no falling off in the prospective demand for the portable drills and tools made by them.

The Philadelphia Pneumatic Tool Co. did a very large business throughout the month. The number of orders was never larger for the same period and covered many of considerable size. Among them are orders from the American Brake Shoe & Foundry Co., Mohawk, N. J.; Lukens Iron & Steel Co., Coatesville, Pa.; Kewanee Boiler Co., Kewanee, Ill.; General Electric Co., Lynn, Mass.; Nicholls Mfg. Co., Ottumwa, Ia.; United Coke & Gas Co., Sharon, Pa.; Penna. Steel Co., Steelton, Pa.; J. F. Hogan & Co., Marion, Ind. (whole equipment, including compressor); Buffalo Expanded Metal Co., Buffalo, N. Y.; Sprague Electric Co., New York; Alex. Traud & Co., Newark, N. J. (complete equipment, including compressor); Hoopes Bros. & Darlington, West Chester, Pa. (special tools for wagon works); Baker & Shelvin Co., Saratoga, N. Y.; A. M. Crane & Co., Chicago, Ill.; American Bridge Co., Pencoyd, Pa.; Pratt & Letchworth, Co., Buffalo, N. Y.; Crocker-Wheeler Co., Ampere, N. J.; Westinghouse-Church-Kerr, New York; Jones & Lamson, Springfield, Vt.; Niles Tool Works, Hamilton, O.; Williamette Iron & Steel Co., Portland, Ore.; Brown & Sharpe Mfg. Co., Providence, R. I.; Detroit Shipbuilding Co., Detroit, Mich.; International Steam Pump Co. (2 plants); Geo. V. Cresson Co., Philadelphia; Tennessee Coal, Iron & Railway Co., Birmingham, Ala.; Rogers Locomotive Works, Paterson, N. J.; Vulcan Iron Works, Toledo, O.; Cambria Steel Co., Johnstown, Pa.; and several from their foreign representatives.

E. L. Martin, agent for the Union Steam Pump Works, Battle Creek, Mich., had a very good month's business, among the orders being the following: a 16x12x16 pump for elevator duty for the Hotel Walton, Philadelphia; a 30x3½x20 pump for Pittsburg parties, for hydraulic duty, and to work against 3,500 pounds water pressure with 60 pounds steam; a 12x2x12 high pressure pump to work against 2,000 pounds pressure with 80 pounds steam for the Delaware Rubber Co., Philadelphia; a complete deep well outfit for the W. J. & Seashore Railway, Atlantic City; a 4x4x5 low duty pump for the Atlantic City Hygienea Milk Co., Atlantic City, N. J.; a 16x10x16 pump for elevator duty for J. Craig McLanahan, Nashville, Tenn., ordered through the Plunger Elevator Co.; two 12x7½x12 hot water boiler feed pumps for parties in Bridgeport, Pa.; and a 5x3x6 hot water boiler feed pump for Pottstown, Pa., parties.

LAKE SUPERIOR IRON MINES.

Matthew Lee, for many years with the diamond drill contracting firm of Cole & McDonald, and lately a partner, has bought drills and established himself in business on his own account. He has some contracts on the Menominee range and will devote himself chiefly to the older districts. A number of new contracting firms have sprung up on the Mesabi in the past year, and all of them are now busy with, generally speaking, small equipments. The two older and larger firms of E. J. Longyear and the Cole & McDonald Exploration Co., are very busy, Mr. Longyear with more than 100 drills, chiefly churn, and the other firm with fewer churns but many more of the heavy diamond drills. This latter firm is doing all the Vermillion range work with the exception of a single drill operated at "Section 30" by F. G. Seineke, an old Negaunee boy, who has had much experience in various parts of the world.

Both the Duluth, South Shore & Atlantic and Chicago & Northwestern roads are grading roadbeds to the Breitung hematite and the Mary Charlotte mines at Negaunee. Stripping at the latter is under way with a considerable force and shaft work is also being pushed so that the mine will be in readiness for shipment when the surface is taken off.

Pickands, Mather & Co. are operating this year, as new mines on the Mesabi range, their Troy, Utica and Albany. The Troy is in section 7-57-17, south of the Fayal; Utica is in section 2-57-21, and the Albany is in section 32-58-20. Troy began shipment this week. It is an ore body of moderate size and of a depth of about 100 feet. Considerable difficulty was experienced in opening the property on account of quicksand and water, which delayed shaft sinking for months. There are now four pumps on the property, one of them a large duplex Prescott. It is the third wettest operating mine on the range. The lease of this mine was bought two years ago from A. Maitland, of Negaunee. Alworth, Hull and Boring own the fee and get 25 cents a ton. Utica covers 100 acres in sections 2 and 11, and the shaft is sunk through the foot of the big Mahoning dump, the mine having been found after the Mahoning was stripped and the stripping had been deposited where it was supposed there was no ore. It is partly an open pit property and contains a large tonnage of excellent ore. The lease was bought from W. H. Cole, D. McDonald and others. The fee to this mine belongs to the West Mesabi Land Co. (Great Northern road) and Burrows and Rust. Albany was noted as having the deepest hole in ore ever sunk in the course of a Mesabi exploration; it was 430 feet in ore. This is an 80-acre tract, the west half of the southwest quarter of section 32-58-20. The ore is of excellent structure and in good quantity. It was bought from Mr. Maitland at the time the Troy lease was purchased. The fee belongs to Laura A. Day, of Minneapolis, and the rate of royalty is 25 cents a ton.

Pickands, Mather & Co. are also shipping from their Sparta, Malta, Corsica and Elba mines, but are not liable to get out much from the Elizabeth, which was on the list as a possible shipper earlier in the year.

The new Kinney mine of the Republic Iron & Steel Co. commenced shipments, over the Great Northern road, last week, and will probably make about 75,000 tons this year. The mine has been stripped at heavy cost during the past winter and can easily make a very much larger shipment, if desired. It is a property of considerable size and of reasonably good grade. On part of it the royalty is but 18 cents a ton.

At the Sharon mine of the Minnesota Iron Co., formerly of the Sharon Steel Co., both shovels in stripping have now been taken off, the second one a few days ago. Both shafts are active, the one only in the daytime and the other in development work chiefly. The shipment of the year will not be up to anticipations. Shaft No. 2 is a new one, lying north of No. 1 and the open pit, and will ultimately secure a very large product.

Lackawanna Steel Co. Bonds.

The governors of the New York Stock Exchange have admitted $3,398,000 first mortgage 5 percent bonds of the Lackawanna Steel Co. to trading. The balance sheet of April 30, shows the cost of the property to be $23,222,849.97, from which $1,381,063.39 surplus of constituent companies is subtracted and $5,544,987.85 of investments in other companies added, making capital assets $27,386,774.45. Current assets are $10,694,582.15. The authorized capital stock is $60,000,000, of which $35,000,000 is subscribed and $29,011,600 is paid in. Of the $20,000,000 first mortgage convertible 5 percent bonds $15,000,000 has been subscribed and $6,128,083.14 paid in. The $40,000,000 capital was increased to $60,000,000 to provide for such conversion of the bonds as shall be made. Of this total amount, $19,971,400 has been issued, share for share, for stock of the Lackawanna Iron & Steel Co., $15,000,000 has been subscribed in cash, of which 60 percent has been paid and 40 percent is subject to two calls of 20 percent each on 60 days' notice, $5,000,000 is reserved for future issue and $20,000,000 for purposes of conversion.

No Agreement on Molders' Wages at Youngstown.

(Special Telegram.)

YOUNGSTOWN, O., July 1.—The molders of this city are still at work. On Saturday, June 27, a conference was held, in which Messrs. Valentine and O'Neil, representing the Iron Molders' Union at large, and J. B. Anderson, of Youngstown, appeared for the men and M. A. Neeland, of the Wm. Tod Co., H. W. Morgan, of the Morgan Engineering Co., Alliance, O., and John A. Penton, of Detroit, represented the founders. The men had originally asked for a $3.15 minimum and a 25-cent advance all around. Later they proposed a $3 minimum, against $2.90, as at present, and a 10-cent advance to all. The foundrymen did not consider business conditions to warrant any advance whatever, but in conference offered to pay the 10-cent advance per day to each molder. This the molders refused. The matter is now in the hands of the executive committee of the Molders' Union.

Machinists' Demand at Pittsburg.

(Special Telegram.)

PITTSBURG, July 1.—The conference between Pittsburg machinists and their employers' committee adjourned last night without agreement. The union men are working today and no strike is expected. The employers offered a 5 percent advance and the machinists came down from 15 percent to 10 percent and waived their demand for the strict unionizing of shops. This the employers would not under any circumstances agree to. The probability is that the men will yet make another proposition. A mass meeting will be held Thursday night. It is understood the men will consider the compromise which had been partially agreed to but subsequently withdrawn. The only machine shops idle today are certain non-union ones where the men demand a straight 15 percent advance.

Alabama Coal Mining Scale Still Unsettled.

(Special Telegram.)

BIRMINGHAM, Ala., July 1.—The joint convention of coal miners and operators adjourned yesterday subject to the call of the chairman without having agreed on a wage scale for the ensuing year. The miners accepted the operators' advance offered, but insisted that the other demands for an additional increase of 2½ cents a ton, the eight-hour day and semi-monthly payday be arbitrated. This the operators refused. All mines will suspend operations until a new agreement is signed. No serious trouble is expected. The miners' original demand was for an increase of 7½ cents per ton in the price for cutting coal. The minimum heretofore, based on the Pratt seam, has been 45 cents and the maximum 55 cents.

W. G. Bryant, of Carterville, Mo., and others have organized a company which will reopen the Galena Iron Works, Galena, Kas. The plant will be opened early in July and will employ about 200 men.

The Moore Drop Forging Co., Springfield, Mass., will remove from its present location on Albany St., and locate in another part of Springfield or in some other city. This move is the result of litigation begun by a property owner, who charged that the company disturbed the quiet of the neighborhood by the use of heavy drop hammers and by emission of smoke from its chimneys. The case was decided against the company, and it has been given till December 1 to move.

Cleveland Machinery Market.

OFFICE OF *The Iron Trade Review*,
1064 ROSE BUILDING.

CLEVELAND, July 1.—Cleveland manufacturers, in addition to being requested for general news of interest to the trade, were asked in the past week to express their views on prevailing conditions at a time when the country seems to be in the early stages of a readjustment of values.

President Gobeille, of the Gobeille Pattern Co., says: "When dullness sets in we naturally feel it first, for the foundry and machine shop are busy, say, three months after we get the last patterns made. There is no let-up yet. The locomotive, car and mill men are apparently as crazy as ever. We are very busy also on patterns for engines, pumps, compressors, and machinery for mining and removing rock, clay and sediment. We are turning away profitable and desirable orders right along because our facilities and capital are fully employed. From our view point the prospect is much better than a year ago when we looked for a speedy slump. The strikes are not dangerous—only sad, like the ever-recurring pestilence in India. In a rough, uncouth way, strikes and lockouts help to curb production and to postpone the evil day. Wages have advanced with us about 20 percent; lumber about 30 percent the past two years. The tendency of skilled labor is toward an eight-hour day with ten hours pay. This could be achieved now if the wage was based on the average of past five years. The holding up of skilled artisans and mechanics by 'sympathy strikes' in aid of unskilled union men—brickmakers, subway diggers, etc.—will soon be stopped by the skilled unionists themselves. Politics is a factor; also crops."

The Globe Machine & Stamping Co. says: "Although the range of prices quoted us last year was higher than has obtained in previous years, we find that quotations on iron and steel materials are averaging still higher this year, and where we require any finishing operations or machining there is a proportionate advance on this also. In spite of these conditions and the fact that we have advanced our rates also proportionately, we are having no trouble in securing business, which sorely taxes our capacity. As far as we are concerned, business is improved over what it was last year and no decline is in sight. In addition to serving a large list of regular customers we are securing a lot of nice business from a number of large manufacturers, who under ordinary circumstances do the work they place with us, in their own factories, and this fact indicates that they are taxed beyond their present capacities. On the whole, conditions are very satisfactory and the outlook remains promising. We are constantly increasing our capacity and equipment, both by acquiring additional space as well as continually installing new machines and tools, and on 'looking backward' we are surprised and pleased to note that we have doubled our plant and equipment during each period of six months during the past two years, and we hope to continue this policy as long as the outlook remains as it is. The sales of our improved oblique tumbling barrels continue to be very satisfactory, and we have recently established exclusive selling agencies in Pittsburg, St. Louis and London, Eng., and are now negotiating with houses who have written for agencies in other important American cities, as well as on the European continent."

The Marshall & Huschart Machinery Co. found the month of May slow, but reports that business is now excellent and the outlook bright.

The Cleveland Punch & Shear Works Co. has noticed a considerable falling off in trade during the past few months. General Manager Thomas says: "There has been no tendency to lower prices among machinery manufacturers, so far as we have heard, and the fact that almost all manufacturers have a large number of unfilled orders, probably has contributed towards holding up prices during the period when inquiries and orders have fallen off. We look for better business after the first of next month, and do not believe that there is any reason to be worried over the fact that things have been a litle quiet for the past few months."

Foote, Burt & Co. express the opinion that the diminution of orders is a good thing for the machine tool men, as it gives it a chance to catch up and prevents manufacturers from bidding up on each other in an unwarranted way on wages.

The Standard Welding Co. finds that there is a marked conservatism among various manufacturers. The company does not think there is the same optimistic feeling in the trade that prevailed a year ago, but outside of two or three special articles it has not noticed any change in prices. The conditions at the present time appear to be good, much better than a year ago, when an ultra-optimism seemed to prevail everywhere.

The Acme Machinery Co. is running full in all departments and indications for the future are most encouraging.

The C. O. Bartlett & Snow Co. says: "Six months ago we predicted in your paper the great danger of strikes and they have come and are here. We are getting a good dose of it in every city. If anyone doubts the seriousness of the strike question just let him consider for a moment that nearly the whole time at the convention at New Orleans of the National Association of Manufacturers was taken up in discussing the labor situation and the unreasonable demands of the labor unions. In other words the manufacturers are mad and will not budge another inch. If the laboring men, so called, of the United States want to bring around hard times, they have the power to do so and we rather guess they will."

The Long Arm System Co., through W. B. Cowles, managing director, writes as follows: "The special conditions and outlook for this company are excellent. We have passed through our 'period of re-adjustment' and have now entered upon a period wherein we are pressed and rushed to the limit with business. If dull times should come they would rather help us than harm us because of reducing our costs of labor and material without in any way affecting our contracts for Government work for the next two or three years. So far as I can see in a general way the man who is dolorous now and feels somewhat pinched and thwarted is the man who has been indulging for the last two years or so in the general saturnalia of underwriting, syndicating and financial grafting. In this process such gentlemen have gone in for illegitimate profits on get-rich-quick lines; they have used their credit to underwrite and have been called to 'put up,' contrary to their expectations and hopes, and the aqueous 'bonus' which they have received, and hoped to get enormous profits out of, is temporarily or permanently worthless for purposes of collateral or sale. The consequence is that this gentry assume to think the country going to the bow-wows, and, on the principle that 'misery loves company,' they wish to make everybody else believe it. The position of these intensely respectable and conservative gamblers, now caught by their own game, would be laughable if it were not so exasperating. Like the hogs that they are, they put both feet in the trough and have spoiled lots of good food for those who are not hogs. Their ideas of the country's business now are as far below the solid truth as their inflated schemes were above it a year or more ago. On the contrary, the man who has been pushing and plodding away, say at manufacturing business, satisfied with legitimate developments and 6 to 10 percent profits (the man who studies such things as railroad earnings, crop reports, output and sales of iron products and such like realities), sees no trouble in the near future except the one danger, 'lack of confidence,' which these underwriting and 'stock bonus' gamblers are endeavoring to manufacture out of their own copious 'blue funk.'"

The Vulcanus Forging Co. reports that inquiries are coming in fairly strong, but in order to secure business it is necessary to make prices which net very little or no profit. The company has decided to discontinue the manufacture of all lines of material excepting rivets and air brake pins.

S. Bader, representing the Resek Machine Tool Co., manufacturer of machine tools for brass and iron work also high grade steel balls, reports a large sale of the company's B. & C. saws. The Resek Machine Tool Co. has recently erected new shop buildings on Quincy St., corner of Craw Ave., and has equipped them with the latest machinery and tools for the economical production of the B. & C. saw No. 1.

The Chisholm & Moore Mfg. Co. advise us as follows: "It is true 'the country seems to be passing through a period of readjustment of values.' As regards, however, the prices of merchandise, and especially those in the iron line, we do not see how there can be very much of a decline in values in the face of the large trade of the country and the constantly increasing price of labor, which more than offsets any shrinkage in the price of the raw material. We believe that after the summer months are passed we will see a very decided increase in prices all along the line. As far as we are personally concerned, our trade still holds out and we look for a good year."

The Electric Controller & Supply Co. writes: "We do not find it necessary to readjust our prices although we find that we have to sell at a pretty close margin to secure trade."

A SHOP TABLE OF DECIMAL EQUIVALENTS.

Many ways have been devised for arranging the table of decimal equivalents of fractions of an inch. The one illustrated is a reduction to one-twenty-fifth of a blue print conspicuously placed on the wall of the machine shop of George D. Walcott & Son, Jackson, Mich. The table is easily seen from the machines on the floor and the arrangement is particularly convenient in connection with setting hand wheels, etc., having a rim or hub divided for micrometer adjustment. Some micrometers, though not all, are stamped with decimal equivalents and the table is not nearly so valuable as in the case of the workman at the lathe, etc., but in any event the blue print is very much in evidence and useful. It will be seen that any other arrangement of the fractions to render them as readily deciphered at the same distance as the rest of the table would have considerably increased the space taken up by the figures which are compactly and plainly arranged.

1/64 0 1 5 6 2 5	17/64 2 6 5 6 2 5	33/64 5 1 5 6 2 5	49/64 7 6 5 6 2 5
1/32 0 3 1 2 5	9/32 2 8 1 2 5	17/32 5 3 1 2 5	25/32 7 8 1 2 5
3/64 0 4 6 8 7 5	19/64 2 9 6 8 7 5	35/64 5 4 6 8 7 5	51/64 7 9 6 8 7 5
1/16 0 6 2 5	5/16 3 1 2 5	9/16 5 6 2 5	13/16 8 1 2 5
5/64 0 7 8 1 2 5	21/64 3 2 8 1 2 5	37/64 5 7 8 1 2 5	53/64 8 2 8 1 2 5
3/32 0 9 3 7 5	11/32 3 4 3 7 5	19/32 5 9 3 7 5	27/32 8 4 3 7 5
7/64 1 0 9 3 7 5	23/64 3 5 9 3 7 5	39/64 6 0 9 3 7 5	55/64 8 5 9 3 7 5
1/8 1 2 5	3/8 3 7 5	5/8 6 2 5	7/8 8 7 5
9/64 1 4 0 6 2 5	25/64 3 9 0 6 2 5	41/64 6 4 0 6 2 5	57/64 8 9 0 6 2 5
5/32 1 5 6 2 5	13/32 4 0 6 2 5	21/32 6 5 6 2 5	29/32 9 0 6 2 5
11/64 1 7 1 8 7 5	27/64 4 2 1 8 7 5	43/64 6 7 1 8 7 5	59/64 9 2 1 8 7 5
3/16 1 8 7 5	7/16 4 3 7 5	11/16 6 8 7 5	15/16 9 3 7 5
13/64 2 0 3 1 2 5	29/64 4 5 3 1 2 5	45/64 7 0 3 1 2 5	61/64 9 5 3 1 2 5
7/32 2 1 8 7 5	15/32 4 6 8 7 5	23/32 7 1 8 7 5	31/32 9 6 8 7 5
15/64 2 3 4 3 7 5	31/64 4 8 4 3 7 5	47/64 7 3 4 3 7 5	63/64 9 8 4 3 7 5
1/4 2 5	1/2 5	3/4 7 5	

SHOP TABLE OF EQUIVALENTS. ORIGINAL SIZE, 22 X 34 INCHES.

We are indebted to Prof. Dupuy, of the Lewis Institute of Chicago, for a copy of the blue print, each of the dimensions being five times the corresponding one in the table as reproduced.

Obituary.

Robert Marshall, a well known foundryman and elevator builder of Pittsburg, died June 22, age 67 years.

G. A. Warner, formerly a wealthy resident of Minneapolis, and at one time interested in Mesabi iron mines, died in Los Angeles, Cal., June 25, age 76 years.

Isaac V. Holden, Bridgeport, Conn., vice president of the Wheeler & Wilson Mfg. Co., died June 25 in a private hospital in New York City. Mr. Holden was born in Preston, Conn., in 1832. He graduated from Dartmouth in 1852, taught school for nearly 20 years, and was an attorney for a number of years. He had been connected with the Wheeler & Wilson Co. since 1872.

The Glacier Metal Co., of New York and London, has established a Southern office at Richmond, Va. Glacier is a babbitt metal used for high speed and heavy running machinery.

OLD EMPLOYES REMEMBERED.

At the celebration of the fiftieth anniversary of the Lake Superior Iron Co., at Marquette, Mich., June 25, to which brief reference was made in these columns last week, James Gayley, first vice president of the United States Steel Corporation, presided and made an appropriate address, tracing the wonderful development of iron ore mining in the Lake Superior district. In conclusion, he spoke of the steel corporation as the greatest product of this industrial age, standing for all that is best in the industrial world. In introducing Peter White, Mr. Gayley paid a fine tribute to the work of the early pioneers who settled in the Lake Superior region and were concerned in the founding of the mining business. Indomitable as to purpose, intelligent as to action, to these hardy men, he said, more is due than we of the present day can realize.

After Mr. White's address, Hiram Burt was called upon by Mr. Gayley and responded briefly, presenting to the chairman the original patents of the lands of the Lake Superior company which were granted by the government to Mr. Burt's father. He told how they were preserved at the time of the great fire at Marquette by being carried out into the bay in an open boat whence they were washed ashore and afterwards picked up. He recalled the fact that this year also marked the fiftieth anniversary of two other important achievements, in this peninsula, the building of the first canal at the Soo and the opening of the Iron Mountain railway. The papers will be preserved in the archives of the company.

A number of other speeches were made and then John Sliney read a list of 222 names of men who had been in the employ of the company for ten years or more. Each was presented with a handsomely embossed certificate. Capt. McEncroe, Michael Hickey, Peter Redmond and Miss Catherine McHugh, daughter of the late John McHugh, were given $100 each, in gold. The length of service of the men has been forty-five, forty-three and forty years respectively. McHugh had been with the company forty-three years. All the others were presented with various amounts in gold on the following basis: Those who had been with the company from ten to fourteen years, $10; twenty to twenty-four, $15; twenty-five to twenty-nine, $20; thirty to thirty-four, $25; thirty-five to thirty-nine, $30.

Cincinnati Machinery Market.

CINCINNATI, June 30.—Compared with the extremely buoyant conditions which prevailed 60 days ago there is a noticable tendency toward a more normal trade. The shops are all busy and there is a fair run of new business coming in all the time. Most of the demand now is for immediate shipment and the shop that has the machine ready for delivery has the preference. The fact that many of our machine tool builders have lost some of these orders shows they are not carrying any stock and are selling their machines as fast as built. While trade is still mostly domestic we hear more and more comment about an increase in foreign orders. Prices are well maintained and it is believed the advance in planers of 5 percent on July 1 will not be contested. Jobbers of machinery are using what arguments they can extract from the newspaper reports of Wall Street depression and general trade conditions to buy cheaper but the shops here are too well supplied with orders now to take such comment very seriously. Business from Canada is again picking up, in spite of the tariff discrimination against the United States on machinery.

In reference to foreign business, a local authority makes the comment: "It is remarkable how soon the prejudice occasioned by the Spanish-American war has passed away. Spanish merchants are ordering large amounts of machine tools from Cincinnati; while the trade with Russia has dropped off materially owing to the 56 percent tariff placed on American goods."

The situation in the machinery trade on the whole is quite satisfactory. That business is not up to the recent high record is not disturbing the manufacturer, as he is busy enough and it can hardly be expected that trade through the summer months should be up to the full limit of the rush which was experienced last winter.

The Cincinnati Shaper Co. reports orders very satisfactory and has found it necessary to install a few more new machines. These were needed to keep up with orders but it is suggested that the decrease in working hours from 57 to 55 hours a week may have had something to do with the need. The company reports the outlook for the future very good in its line.

The Lodge & Shipley Machine Tool Co., reports orders fair and that it is making reasonably prompt delivery on smaller machines, but for the larger machines the company is still behind on orders. Customers are pushing for delivery and it is difficult to satisfy their wants. Except for inability to get work out as fast as wanted trade is satisfactory.

The John Steptoe Shaper Co. reports a nice run of orders the past month and general trade holding up quite satisfactorily. The company has just shipped off an order for Stanleyville, Africa, and two shapers for Mexico, although reporting foreign orders rather occasional.

The Cincinnati Machine Tool Co. says that business is keeping up nicely, there is nothing new to report. The plans for the new building the company will erect this summer are still under consideration.

The Rahn-Mayer-Carpenter Co. finds no change in the satisfactory conditions. Orders are coming along in good volume with a perceptible increase in trade from points west of the Mississippi river.

Greaves, Klusman & Co. report export trade improving and they continue busy with a fair run of orders from rather widely distributed sources.

The Cincinnati Milling Machine Co. is receiving a nice run of orders from its Montreal agents and notes an improvement in Canadian trade. Good progress is now being made in the addition the company is building to relieve the crowded condition of the plant. Business is holding up fairly well and conditions are quite satisfactory so far as deliveries of material are concerned, particularly castings.

The Cincinnati Planer Co. has no complaint to make of any kind. The orders the past month were quite satisfactory. Among those received were orders for two 36-inch planers for the Jeffrey Manufacturing Co., Columbus, O., one 36-inch planer for the Long Arm System Co., of Cleveland, O.; one 48-inch planer for Chis Ehrhart, Cincinnati, and one 24-inch planer for the Buffalo Gasoline Motor Co., of Buffalo, N. Y.

The Bullock Electric Manufacturing Co. at a meeting of the directors on June 24, declared the regular quarterly dividend of 1½ percent payable on July 1st. The books of the company will be closed from June 25 to 30 inclusive.

Cincinnati will soon be turning out the McGovern cold tire setting machine, which was formerly manufactured and marketed from Lime Rock, Conn. Through the instrumentality of the Cincinnati Industrial Bureau this enterprise was brought to Cincinnati and the business re-organized under the name of the McGovern Tire Setter Co. Four car loads of machinery arrived from Lime Rock the first of the week and is now being erected in one of the auxiliary buildings of the Lodge & Shipley Machine Tool Co.'s plant on Colerain Ave. The McGovern concern will occupy one entire floor of about 4,000 sq. ft. and an extension is being built for the accommodation of the office force. It is the intention of the new company to push the sale of the McGovern tire setter and to put on the market a new hub bander, which has recently been perfected by Mr. McGovern and which promises to be as revolutionary a factor in wheel building as the tire setter has been. The company will also manufacture and sell a patent friction clutch that has attracted a good deal of attention. Mr. B. McGovern will continue in charge of the manufacturing department of the new company and Mr. Harry R. Irwin of this city, formerly of Shaw, Irwin & Co., wholesaler grocers, will have charge of the office and sales end of the business. Several other Cincinnatians are interested in the new company, including Wm. Lodge, of the Lodge & Shipley Machine Tool Co., and Jacob Dietz, of the Dietz Machine Tool Co. While the concern will employ only about 25 men in the beginning, it is expected that the business will develop very rapidly and become a prominent industry of the Queen City. Mr. McGovern will become a permanent resident of Cincinnati, having arrived with his family last week. He was also accompanied by his old foreman, who will continue his position with the new company.

Proposed German Duty on Machinery.

United States Consul J. F. Monaghan, of Chemnitz, writes to the State Department as follows:

"As always happens in a country when the revision of its tariff has been consummated, all parties are not content and strong opposition develops. Chemnitz papers, assuming spokesmanship for the great machine interests of the city, express dissatisfaction with the duty upon machinery. It is contended that not only is the new tariff entirely out of keeping with the high duties imposed upon machinery by other countries, but it also fails to maintain a proper relation between the duty upon the raw materials used by machine builders and that upon the finished machines.

"As to the comparative amount of protection offered by the German tariff and that of other nations with which the German Empire enjoys a good export trade in machinery, it is demonstrated that while the new German tariff incorporates a duty of from 3 to 5 percent, and, in some cases, even as low as 1½ percent, the American duty averages 45 percent, while Austria recently raised her duty about 20 percent, and with certain classes of machinery more than tripled it. Russia, also, has almost doubled her duty on machinery.

"The comparative lowness of the German tariff is considered a most serious menace to the machine-building industry of the country. It is urged that the present tariff be amended so as to provide the country with an effective weapon for the conclusion of reciprocity treaties with other nations. The new Austrian tariff, it is believed, will seriously injure the export trade of Germany to that country, which, in 1901, amounted to the considerable sum of $4,300,000 for machinery and parts of machines. Austria, it is reasoned, has put on her armor in anticipation of commercial wars.

"How far these sentiments find support at Berlin is unknown; but since the publication of the new tariff in its final form, criticisms seem to have been strengthening, so that the possibility of more material influence leading to a revision of the present machine duties is by no means precluded."

The Ball Engine Co., Erie, Pa., has sold the S. W. Card Mfg. Co., of Mansfield, Mass., a 100-h. p. self-oiling engine for electrical purposes.

A NEW UNIVERSAL SHAPER.

A certain amount of hand work has long been an accompaniment of intricate die making as well as some lines of metal patterns and jigs, fixtures, etc., but the machine seen in the illustrations has been designed to reduce this

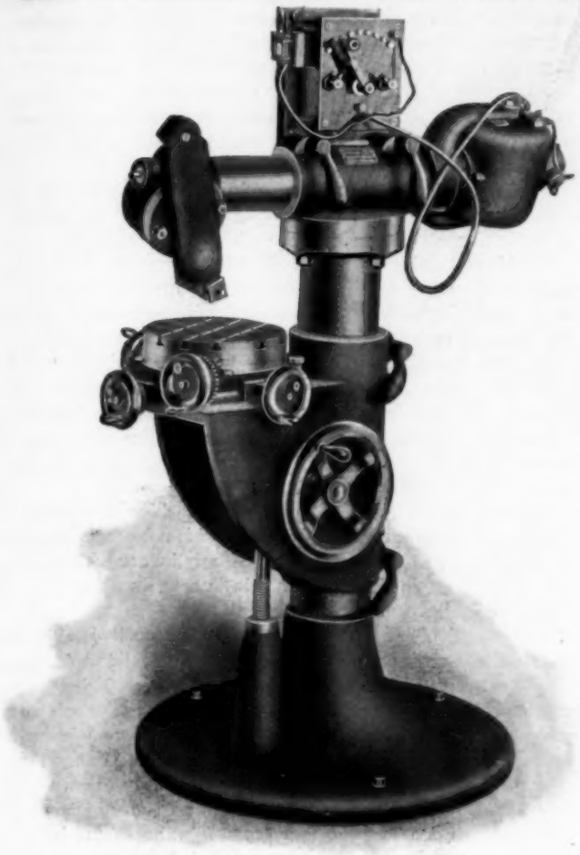


FIG. 1.—THE COCHRANE-BLY UNIVERSAL SHAPER.

drudgery where the universal milling machine or shaper of common construction would not be serviceable and speedy. The tool cuts from the surface of the work leaving no burr to cover the lines and the outline of a blanking die or punch for example can be machined closely with a minimum of hand work. Sharp corners and very narrow slots may be cut with ease.

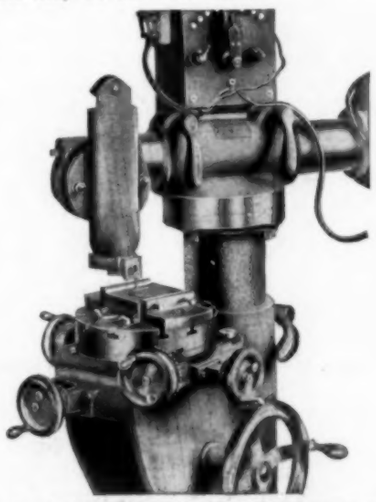


FIG. 2.—SHAPER SLOTTING OUT A BLANKING DIE.

A general view of the machine is illustrated in Fig. 1, The ram is driven by a worm and wheel direct connected to a motor at the opposite end of the arm. The stroke of the ram is adjustable from ½ inch to 2 inches and work may be planed at any angle. The clapper block is also capable of adjustment in any position about the end of the ram and tools may be clamped either on the end or the side. The head of the column which supports the arm with the working head is graduated and may be clamped in any position about the column. The arm has also an in and out adjustment by sliding through the head and this allows the tool to be brought to any position over the table. This working head can be set to any angle about its axis, which is at right angles to the arm, and the latter may be also adjusted in turn about the axis. Graduated dials are provided for both these adjustments.

The table has a circular and two cross feeds, the hand wheels having graduated dials for micrometer readings. The table is rotated by a worm and wheel which may be disengaged for quick adjustment. The cross feed screws have ball thrust bearings and are provided with adjustable nuts for the take up of wear. The table is graduated and

FIG. 3.—SHAPER ROUGHING OUT A PUNCH.

the circular movement may be locked in any position. The ratio of the worm to the wheel is identical with universal dividing heads and is useful for index work as in cutting dies for small gears, armature discs, etc. The table is supported by a stout knee firmly gibbed to the column and is raised or lowered by the large hand wheel seen at the right.

Fig. 2 shows the machine slotting out a blanking die. It will be noted that the compound adjustment of the head renders it possible to plane into a corner and give the proper amount of clearance at each side of the cut.

The machine is set in Fig. 3 for horizontal planing and is at work roughing out a punch. The greater part of the stock has been removed and with the aid of the circular

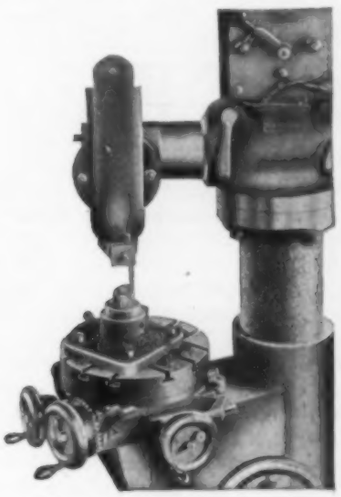


FIG. 4.—FINISHING THE PUNCH.

feed to table a clearance groove has been cut around the base.

The same punch is illustrated in Fig. 4 where the tool head is swung to a vertical position and a finishing cut is being taken. Working from the face of the punch with the lines in full view the final cuts may be made with accuracy.

The leading dimensions are as follows: The table diameter is 10 inches; movement of knee 7 inches; movement of arm 7 inches; cross movement of table 3½ inches; maximum distance from tool holder to table when ram is vertical, 7¾ inches.

The machine is a recent production of the Cochrane-Bly Machine Works, of Rochester, N. Y.

RIVETS IN STRUCTURAL STEEL WORK.

BY C. J. TILDEN.

In dealing with the question of rivets in structural steel work the writer does not pretend, in what follows, to make anything like an exhaustive investigation of the subject. The intention is merely to note briefly some of the differences between theoretical and actual conditions, which have been noticed in an experience of some years in shop and drafting-room, and to suggest, if possible, a means of comparison, in this particular instance, between theory and practice.

A theoretically perfect rivet should fill the hole completely, be of homogeneous material throughout, and have two well-formed heads. The strength of a riveted joint depends, theoretically, on but two considerations: first, the shearing strength of the rivet material, usually soft steel; and, second, the number of rivets used. When comparatively thin plates are joined by rivets of large diameter, it may happen that the resistance of the metal to crushing is less than the shearing strength of one rivet; in which case the crushing or "bearing" value of the metal determines the value to be given to each rivet in calculating the strength of the joint. The question then arises, with what degree of safety may the designing engineer accept these theoretical assumptions, and how are they borne out by the conditions which occur in shop practice?

In the first place, the material of a rivet is not homogeneous. In a large majority of cases, it is probable that test pieces taken from different parts of a rivet after driving, assuming that such small pieces could be properly tested, would show widely different characteristics, and these totally different from similar tests of the same rivet before driving. A very good idea of the great difference in quality of rivet material after driving may be gained by watching for a few hours a shop gang engaged in cutting out rivets which have been condemned by the inspector. Sometimes the metal is hard, tough, and fibrous; then again nearly as soft, to all appearances, as lead or pewter; and occasionally the rivet head will fly off at the first blow of the hammer, apparently almost as hard and brittle as glass.

A second noteworthy discrepancy in the design of riveted joints is the failure to take account of the action of the rivet heads in bringing the two or more surfaces into very close contact, so that a large amount of friction is developed. It is quite possible that this friction may amount to more than the shearing strength of the rivet. In any event, it is a very important factor in the strength of a riveted joint.

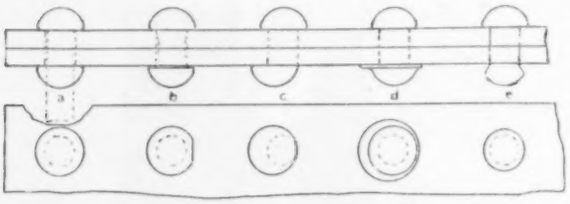


FIG. 1.—EXAMPLE OF RIVET WORK.

In the diagram, Fig. 1, are shown some of the more frequent imperfections in rivet work, resulting from carelessness of the workmen. At *a*, for comparison, is sketched a perfectly driven rivet. The original form is shown dotted, the "shank" being 1-16 or 3-32 of an inch less in diameter than the hole which it is to fill, and enough longer than the "grip," or length between heads, to allow the formation of the new head, and the squeezing out of the rivet material sufficiently to fill the hole completely. Both heads should be concentric with the shank, and the rivet should be perfectly tight, giving a clear, sharp ring when struck with a light hammer.

At *b* is shown a loose rivet which has been "caulked," with a cold-chisel, to make it appear tight under the inspector's hammer—a favorite trick of careless riveting-gangs, and often very difficult to detect; if suspected, a close examination should be made of the head of the rivet for signs of the caulking-tool, especially if the rivet has been generously bespattered with fresh paint or tobacco juice. Both these commodities, always plentiful in the shop, are favorite means of concealment for "scamped" work of this character. A result very similar to caulking, but much harder to discover, is sometimes secured by using the riveting-machine, or "bull," as it is familiarly known to the shop men, on the cold rivet. The movable cup of the "bull" is brought sharply against the rivet head, securing somewhat the effect of a blow, and this is repeated four or five times on each loose rivet. In general, this machine caulking is not very effective, but the writer has known instaces where it has been successful. It is well-nigh impossible to tell from the appearance of the rivet head afterwards if this trick has been attempted. A very slight polish on the head of the rivet is about all the evidence that ever appears, and this is readily hidden by a dab of grease or dirt, or the ever-ready tobacco juice. It is a form of "scamping" that is seldom resorted to, however, as it is more work than caulking with the cold-chisel, and far less likely to accomplish its purpose.

The sketch *b* also shows the probable result of heating the rivet unevenly. Where the heating is done in an ordinary portable forge, fired with coke, the forge-tender gets into the habit of heating only that part of the rivet which is to be upset to form the head, leaving the remainder comparatively cool. Referring to Fig 2, for example, from the lower end of the rivet to, perhaps, the point *x*, the metal is at white heat; above that it cools rapidly until the head is practically "cold," often not even a dull red color. This uneven heating not only prevents the rivet from upsetting throughout its length, and so filling the hole, but is apt to injure the quality of the metal above the point *x*, owing to its being worked under the hammer at too low a temperature.

Careless manipulation of the riveting machine may result in the conditions shown at *c*, where the head is not concentric with the shank. The fault can be detected only by comparison with the other rivets in the joint, showing uneven spacing and irregular lines.

The condition shown at *d* results from too much metal in the shank of the rivet before driving, giving a "soldier-cap" head. The reverse of this is shown at *e*.

It must not be supposed that these defects are the only ones which occur in rivet work; they are only a few of the more frequent errors of this kind that may be observed in any shop. Combinations of two or more of the forms shown occur not infrequently, and an almost endless variety of changes may be rung on each one. Of the four types, *b* and *e* should be condemned unquestioningly whenever found, being not only bad workmanship but unreliable. *c* and *d* probably develop the full strength of the rivet, and may be allowed to pass if strength is the only consideration; but if the work is to be exposed they should be cut out and replaced, as they are sure to look ragged in finished work.

As to the actual difference in strength between a perfect rivet, as *a*, and any of the imperfect ones, it is impossible to judge with any degree of accuracy. In fact, if a test were made it is quite conceivable that a rivet such as *b*, or even *e*, might develop greater strength than *a*. About all that can be said is that this is not likely to happen, but rather the reverse, as a properly driven rivet is more likely to develop its full strength than one which is imperfect in any way. But this is not reducing the question to any scientific basis, and, indeed, it cannot be so reduced. Rigid specifications are required for

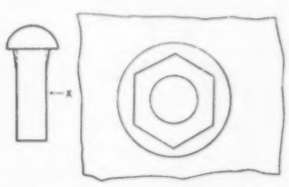


FIG. 2.

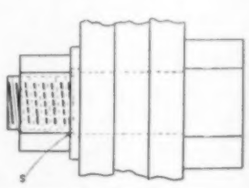


FIG. 3.—TURNED BOLT FOR FIELD CONNECTIONS.

riveted work, and the work in the shop is subjected to the most careful inspection, not because a carelessly driven rivet is less strong, by any definitely calculable percentage, than one which is properly driven, but for the simple reason that careful and accurate work is more reliable.

The nearest approach to a theoretically perfect rivet is probably the turned bolt which is occasionally used for field connections (Fig. 3). In such cases it is the practice of some engineers to require the holes to be drilled instead of punched, or "subpunched and reamed"—that is, punched to a diameter about ¼ inch less that of the bolt to be used and reamed to

proper size. The bolt is turned to a driving fit, and the threaded part is of slightly reduced diameter, the shoulder, *s*, protecting the thread while the bolt is driven home. To keep the nut in place after it is screwed up tight, the projecting threaded end of the bolt is upset against the nut. In spite of the reliability of this connection, however, its high cost precludes its general use.

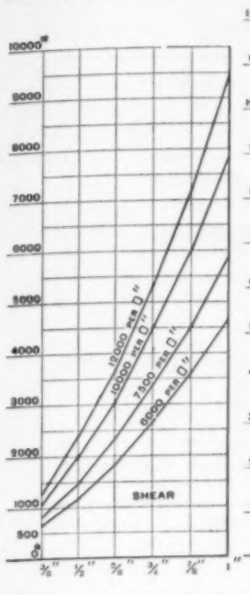


FIG. 4.—TABLE OF SHEARING STRENGTH FOR RIVETS.

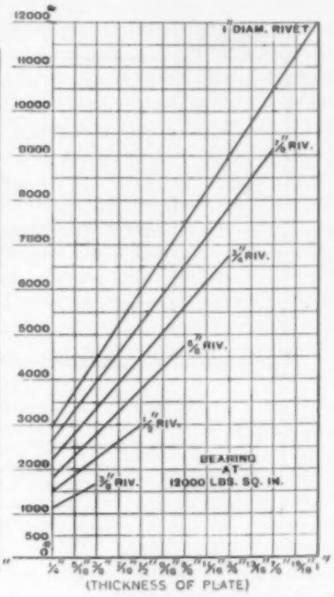


FIG. 5.—BEARING POWER OF RIVETS FOR DIFFERENT THICKNESSES OF PLATES.

Fig. 2 shows a form of rivet which has certain advantages and disadvantages over the ordinary shape. In this form the shank is slightly increased in diameter (exaggerated in the drawing) for a distance of ½ to ¾ of an inch from the head. Directly under the head, at the base of the cone-like enlargement, the shank has the same diameter as the hole into which the rivet is to go—that is, from 1-16 to 3-32 of an inch larger than the main part of the shank. This is an advantage in the shop, where the rivet is sure to be uniformly heated throughout its length, as it insures the complete filling of the hole up to the rivet head. In the field, however, where the rivets are likely to be unevenly heated, such a design would be of doubtful advantage. A rivet of this shape might easily appear sound and tight under the inspector's hammer, and yet have been very imperfectly driven.

The shearing and bearing values of rivets, for various allowable unit stresses, are given in the form of tables in the steel hand-books. In Fig. 4, one of these tables of shearing strength is shown graphically by means of curves, the abscissas representing the rivet diameters in inches, and the ordinates the values of the shear in pounds. These curves are purely theoretical, based on assumed safe unit values for the shearing strength. The lower curve assumes the rivet material to be capable of resisting a shearing stress of 6,000 pounds per square inch; the others are for assumed stresses of 7,500, 10,000, and 12,000 pounds per square inch respectively, as noted. These are the safe unit stresses most commonly assumed in practice, and are all, of course, far below the actual shearing strength of the steel.

Now suppose a series of experiments made on riveted joints to determine their actual resistance to shearing forces. Such experiments could be made with rivets of different sizes, driven under different conditions, and from them the actual strength of a rivet under the given conditions deduced. The values thus obtained could be plotted on the same sheet with the theoretical curves, and through the plotted points curves of actual values drawn. A comparison of these two sets of curves could hardly fail to be interesting and instructive.

Fig. 5 is a diagram somewhat similar to the foregoing, also compiled from the tables in the steel hand-books, showing graphically the bearing power of rivets of varying sizes on different thicknesses of plate, assuming steel to bear safely a crushing stress of 12,000 pounds per square inch. An examination of the diagram will show the method of using it. For instance, assuming the metal to be good for 12,000 pounds' compression per square inch, the bearing power of a rivet 1 inch in diameter on a plate ¾ of an inch thick is 9,000 pounds; that of a ¾ inch rivet on a ⅝ inch plate is about 5,600 pounds, etc. These are, of course, the theoretical values. By means of judicious experiments a set of actual values corresponding to the theoretical could be secured and plotted in the same way as suggested for the case of shear, and curves drawn in, showing actual conditions. The relation between actual and theoretical values of bearing power would then be made graphically comparable, as before.

An investigation, along these lines, of the relations existing between the theories assumed by designing engineers and tne actual conditions of rivet work would make a valuable and instructive subject for a graduating thesis. With the unusually fine laboratory equipment of the Division of Engineering of Harvard University, the work of testing riveted joints of different kinds could be done very accurately, and there is little doubt that any bridge-shop of good standing would be glad to co-operate in work of this character by furnishing, at cost, samples of rivet work to be tested. These samples should, of course, be made up under the personal supervision of the investigator, who would note fully all the conditions of their manufacture. A careful analysis and discussion of the results of these tests would not only furnish excellent training for the student of engineering, but would also make a valuable addition to engineering literature.

Structural engineering especially has advanced so rapidly its followers have had little or no time to devote to its purely experimental phases. It would seem as if a great deal of such work could be put into the technical schools, with much profit alike to the student and to the profession he seeks to enter. —[Harvard Engineering Journal.

Acid-Proof Castings.

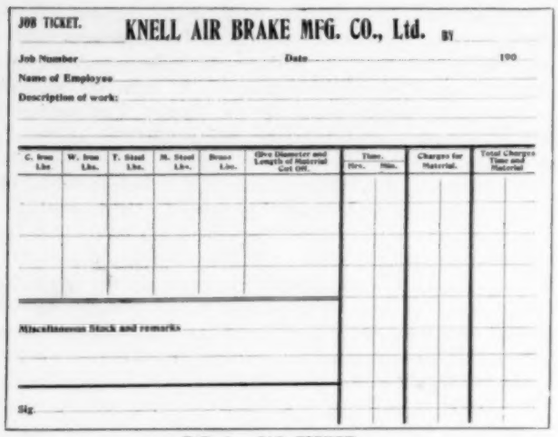
The German metallurgical engineer, Carl Rott, writing in the *Eisenzeitung*, states that for acid-proof castings it is essential to have irons as low in sulphur and phosphorus as possible; also, the carbon should be in the combined form to as great an extent as may be safely allowed. Mineral and vegetable acids affect irons readily which have high sulphur and graphite contents. Silicon and manganese do not seem to be affected as much. The consumption of good irons of this kind is as follows: Silicon, 0.8 to 2; phosphorus, 0.4 to 0.6; sulphur, 0.02 to 0.03; manganese, 1 to 2; and total carbon, 3 to 3.5 percent. Makers of pumps for mining purposes or where there is acidulated water coming from factories are interested in this. As regards refractory castings, Mr. Rott thinks this is not so difficult a problem. A low sulphur content is essential; phosphorus may be normal and manganese low. It is well to have low silicon and carbon. Scrap steel is, therefore, a good admixture. The following is a typical analysis: Silicon, 1.8; phosphorus, 0.7; sulphur, 0.03; manganese, 0.6; and total carbon, 3.9 percent.

The directors of the American Locomotive Co. last week declared the regular quarterly dividend of 1¾ percent on the preferred stock, payable July 21. The following statement was given out by President Callaway: "The earnings for the year ending June 30, 1903, with the month of June partly estimated, were $32,863,730, an increase over the previous fiscal year of $6,465,337. Over $4,000,000 has been expended in enlarging the different plants and in introducing modern machinery. The work of improving and enlarging the plants now outlined and authorized by the directors will be completed during the next fiscal year. The expenditure already made has produced an increase in the output of 40 percent. The company has orders for a large number of engines to be delivered in 1904."

The United Steel Co., Canton, O., has sued the Pennsylvania Railroad Co., for $19,118.90 for damages alleged to have been done by the flood of Feb. 28, 1903. It is claimed that the construction of the railroad track across a creek valley was responsible for the backing up of the water.

SOME FORMS FOR A SMALL SHOP.

The requirements of a small machine shop with, say, a score of workmen are essentially the same in kind with those of a much larger plant. On this account there is, either from sheer imitation, the possibility of a cumbrous system, or, on the other hand an entire reliance upon rough estimates. In either event the machinery of control will be out of proportion to the result desired. Some account of production and cost is a necessity, and the three forms here given illustrate the practice of one concern falling within the category of plants with some twenty or thirty men.


JOB TICKET. KNELL AIR BRAKE MFG. CO., Ltd. BY

Job Number ____ Date ____ 190

Name of Employee

Description of work:

C. Iron Lbs	W. Iron Lbs.	T. Steel Lbs.	M. Steel Lbs.	Brass Lbs.	(Give Diameter and Length of Material Cut Off.	Time. Hrs.	Min.	Charges for Material.	Total Charges Time and Material

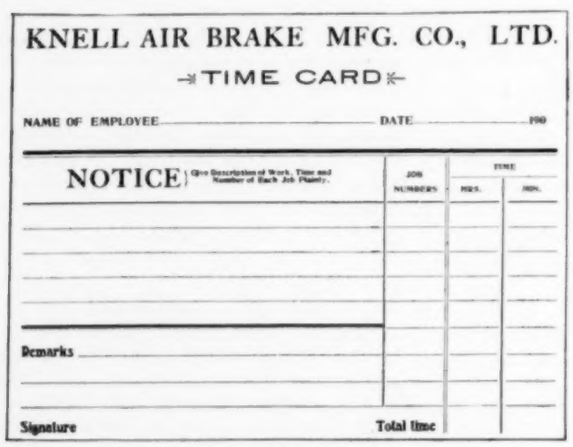
Miscellaneous Stock and remarks

Sig.

FIG. 1.—JOB TICKET.

The Knell Air Brake Mfg. Co., Ltd., of Battle Creek, Mich., was formed for the purpose of making the Knell air brake, which is marketed by another concern. The scope of the firm is not, however, confined to this work and hence the problem of a system becomes a more complicated one. There is not the uniformity of but one line of work to contend with in the manipulation of records and the method must be sufficiently elastic to reach out to the different kinds of work undertaken as well as in itself simple enough to be readily handled by the available force. As will be seen, the cards shown are simple and rugged enough to stand the strain of the shop burden and in practice work very satisfactorily.

The job ticket illustrated in Fig. 1 is 5 x 6½ inches, and is


KNELL AIR BRAKE MFG. CO., LTD.

TIME CARD

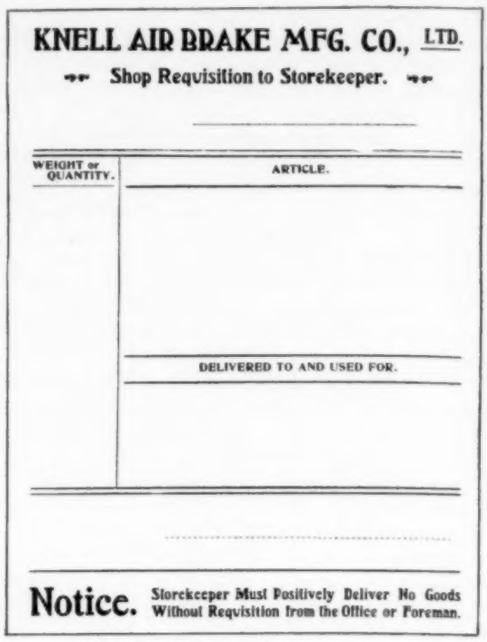
NAME OF EMPLOYEE ____ DATE ____ 190

NOTICE (Give Description of Work, Time and Number of Each Job Plainly.)	JOB NUMBERS	TIME HRS.	TIME MIN.
Remarks			
Signature	Total time		

FIG. 2.—TIME CARD.

the starting point. The upper portion of the sheet being filled in with the number of the job and description of the work. The rest of the form tells its own story.

The time card, shown in Fig. 2, is the same size as Fig. 1, but is readily distinguished by being printed on yellow paper, while the form illustrated in Fig. 1, is on white stock. The lines for name of employe and date as well as the section for remarks and signature are filled out by the foreman, and, as will easily be understood, the two forms are entirely independent; the time card being put into the office at night as a record of the day's labor for use in the preparation of the payroll, etc., and the job ticket may require a less or a greater period in order to finish the work, and is only turned in when the task is finished, and then carries a complete record of the labor and material expended.


KNELL AIR BRAKE MFG. CO., LTD.

Shop Requisition to Storekeeper.

WEIGHT or QUANTITY.	ARTICLE.

DELIVERED TO AND USED FOR.

Notice. Storekeeper Must Positively Deliver No Goods Without Requisition from the Office or Foreman.

FIG. 3.—SHOP REQUISITION CARD.

Fig. 3 shows the form, 4 x 5 inches, used for stock requisitions on the storekeeper.

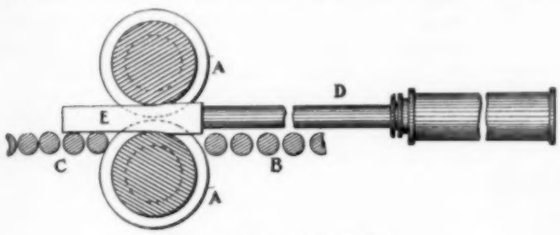
New Books.

"The American Steel Worker," by E. R. Markham, is a substantial looking volume of 343 5½x7¾-inch pages. It is said to be the record of 25 years' experience in the selection, annealing, hardening and tempering of various kinds of steel. The presentation of the subject is broad and workmanlike. The general directions for hardening reamers are qualified and the change in method properly illustrated for half-round reamers, for example, as these are reached by the author in due course. The illustrations are pleasingly different. There has been no apparent borrowing from catalogues. They number up to 160 and are exceptionally distinct and informing. Another feature of value is the comprehensive index. This occupies 26 pages; "pack hardening," for instance, is classified with some 40 references. It would be impossible in limited space to review the work with detailed reference to the various points of interest. There is no attempt at the discussion of the metallurgical problems of steel manufacture, but the manipulation elsewhere is the theme and it is closely followed. The easily overlooked but essential elements in successful steel working frequently crop up here and there—for example, in the main reason why the tool steel bar should be centered as nearly as possible in the axial line of the stock, as well as the proper amount to remove from bars of various sizes. The book is not exclusively devoted to tool steel, but machinery steel, malleable iron, etc., are discussed. The chapters on the cheaper steels will be in fact the most interesting to many manufacturers as well as workmen. Here the author is conservative in his claims for machinery steel but tells why tools of this material, dies, gauges, etc., as well as cams and gears, may profitably be made. The various furnaces, cooling mediums, welding compounds, hardening mixtures, etc., are described with numerous suggestions. The workman who looks for some kink whereby he may create a greater appetite for work among planer and lathe tools will not go hungry, and on the other hand the manufacturer will also find a number of points in regard to the manipulation and selection of machine parts for hardening in quantities. The choice the latter has made of emery wheels will also be worthy of test in connection with subsequent difficulties in hardening, as the one is shown to have an effect upon the other. There are also some noteworthy reflections on the influence of certain forms on hardening, uneven hardening and its cause, etc. The book is published by the Derry-Collard Co., of 256 Broadway, New York, and will be sent on approval. Price, $2 50.

REDUCING INGOTS WITHOUT POWER ROLLS.

William Cooper, of Georgetown, Col., has taken out a patent on a method of rolling steel or other metals, which is illustrated below in the vertical section of a set of rolls arranged according to the requirements of the invention. The inventor says:

"It is a well-known fact that in casting molten steel into molds the outer surface of the ingot becomes chilled and more or less surface-hardened immediately, while the internal structure of the ingot remains liquid and heterogeneous, and the metal at the time of casting being at its highest point of expansion the interior of the ingot is accordingly full of innumerable flaws, caused by gas, blow-holes, and contraction-flaws. By the present method of breaking down, these ingots are placed in reheating furnaces to equalize the heat in the ingot and are then at a very high temperature, and consequently in a decidedly weakened condition, broken down into blooms or slabs in a train of rolls driven by powerful engines, the reduction of thickness of the ingot amounting frequently to more than one inch to each pass. This reduction of thickness, however, by the use of power rolls does not result in a compression together of the crystals and consequent filling of the interstices and internal flaws of whatever nature in the interior of the ingot, but rather in a stretching of the ingot into a greater length, while with its more or less soft interior it is in its weakest condition to withstand the rending power incident to this form of breaking down. The effect of the ingot passing through such power rolls is one of stretching and pulling, and the work is done so quickly that the crystalline particles instead of being compressed together in a compact homo-



METHOD OF ROLLING STEEL.

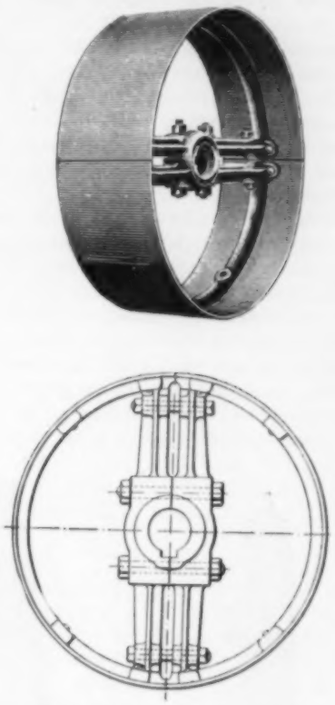
geneous structure are slid past or drawn away from one another and do not become intimately united. It will readily appear from the above that instead of an elimination of internal flaws or blow-holes in the ingot a lengthening and stretching of such defective parts would result just as if the ingot had been hot-drawn or stretched through the same sized aperture without any attempt at compressing the crystals more intimately together. Hammering has been resorted to for the purpose of compressing and solidifying the interior structure of the ingot; but the interior of the ingot being of irregular construction and of a greater or less degree of fluidity some portions offer greater resistance to the blows than others, resulting in varying degrees of solidity or compression in the final product. Heavy presses have also been used in which the ingot is subjected to great pressure; but this method has been found to be very expensive and results in lengthening greatly the time of manufacture."

The new method consists in forcing the ingot through rolls, preferably of larger diameter than the usual blooming-rolls, until the proper size of bloom and a uniformly compact structure are obtained. The rolls are not coupled to any source of power, but are rotated simply through the forcing of the ingot between them. The effect on the ingot is similar to the result of pressing the ingot in a power-press. AA are the rolls fitted to revolve freely in their housings. B and C are the feed-trains, and D is a hydraulic ram used to force the ingote E between the rolls. The inventor claims that the process permits the rolling of metals at lower than the usual temperatures.

The Chicago Pneumatic Tool Co. has declared its regular 1¼ percent dividend for the quarter ending June 30.

NOVEL FORM OF SPLIT PULLEY.

The split pulley shown in perspective and elevation, has the hub, arms and rim cast in one piece. It is split in halves, the irregularity of the fracture making a close and interlocking joint when the halves are bolted together. The hub is then bored and the outer ring turned on the face to which the wrought iron rim is riveted. Two of these cast iron rings

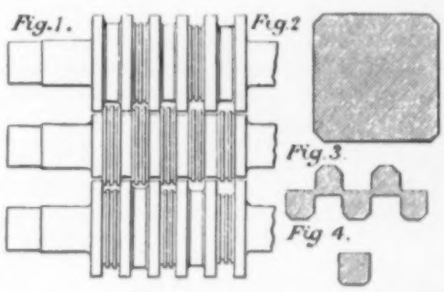


A NOVEL FORM OF SPLIT PULLEY.

are employed for pulleys over 10 inches in diameter. London *Engineering* says that the manufacturers, the Unbreakable Pulley & Mill Gearing Co., of Manchester, England, has found the two arms and ring amply sufficient for strength and there is evidently an advantage in appearance and weight with the simpler design. These pulleys are made up to 18 inches diameter.

New Method of Rolling Small Billets.

An English patent has recently been granted to T. Doughty, of Sheffield, for a means of rolling a billet to a convenient shape for forming a number of smaller billets, such billets for example as may be drawn into wire. The inventor compares his method with the common process of gradually breaking the ingot down to the billet and later on reducing the latter in the finishing mill, in this way a billet of say



4 inches square being reduced to a wire rod. The process proposed passes a 3-inch billet through the five gates of a cogging mill as illustrated in Fig. 1. Each of the gates or grooves is provided with collars which gradually reduce the billet seen in Fig. 2 to the five-pointed shape illustrated in Fig. 3; and at the fifth gate the billet is delivered in five separate strips of the shape shown in cross section at Fig. 4. Each of the strips is then passed forward to a separate finishing mill and rolled into a wire rod in the usual way.

BORING, MILLING AND DRILLING MACHINE.

The Espen-Lucas Machine Works, of Philadelphia, have produced a horizontal floor boring, milling and drilling machine which conforms in its principal features to the larger machines and takes in a wide range of work. It is applicable to boring, tapping, reaming and various kinds of milling, such as keyseating long, heavy shafting in short places, an operation formerly requiring a large machine.

It can be used for face-milling with a rotary cutter head like a rotary planer, and will do end milling. Large castings can be placed on the table, and all work finished without removing the casting. The spindle is 3½ inches in diameter and feeds through a gun metal sleeve. The boring bar has 24 inches of feed. It has a No. 6 Morse taper hole in the end, also a pin hole for retaining the bars and milling tools in place. The head has a vertical adjustment of 30 inches and can be securely clamped in any position for milling. The column carrying the spindle head has automatic feed in both directions, giving 42 inches of horizontal movement to the spindle head for milling. The spindle has feed in either direction for boring and counterboring both ends of cylinders. Among other things the machine takes the place of the old style boring machine, where the work had to be adjusted to the spindle, instead of the spindle being adjusted to the work, and, in this case relieves the milling machine of some of the large work, which would require a larger tool. The spindle is geared powerfully for heavy work and has a five-step cone, which gives ten changes of feed and speed. The platen is 42x84 inches, ribbed to carry large and heavy work.

A BORING, DRILLING AND MILLING MACHINE.

The Westinghouse Electric & Mfg. Co. records that in one instance where 30 steam engines of 1,375 total h. p. were supplanted by 57 motors of 1,065 total h. p., for machine shop driving, the average daily saving in steam was 41.6 percent, of combustibles 32.2 percent (coal saved 20,000 pounds). In other cases electric driving has reduced by 50 percent the cost for engineer, coal, and water; the fuel account 20 percent, the cost of power 44 percent. The gross saving was 30 percent with direct connected motors, and 22 percent with belted or geared motors.

U. F. Houriet, H. B. Camp and other citizens of Akron, O., are interested in a movement for the establishment of a plant for the manufacture of files in that city. Rodolfo Simonetta, of Turin, Italy, who is said to be an extensive manufacturer of files, came to this country recently to be married, and now expresses his willingness to remain and engage in the manufacture of files in Akron or some other city which will give the desired encouragement.

APPRENTICESHIP IN MACHINE SHOPS.*

BY WM. A. VIALL, PROVIDENCE, R. I.

If our beloved President is impressed with the fact that certain classes of our people are guilty of race suicide, what would be his opinion regarding the machine tool builders? It seems as though but little, comparatively speaking, has been done toward preparing and fitting for our shops, men to take the place of those who are passing from us. All of you larger manufacturers are undoubtedly constantly beset with requests to recommend men for some of the smaller shops, and men are wanted for all positions, including managers, foremen and operators of special machines. While all of us are able to make more or less prompt deliveries on machine tools and to manufacture them without limit, we are not able to supply men.

The question of apprenticeship is one that has been of great interest to the company with which I am connected [the Brown & Sharpe Manufacturing Co.] and since its inception it has been very faithfully and consistently followed out. We all know that plenty of so-called machinists are to be had but unfortunately are very apt to belong to the "bum" class and are not men who are able to do the work that is wanted of them; and in many cases, instead of having the well-trained man, we are obliged to take men who are not only not fitted to do the work but are hardly fit to have about our shops, for they are not interested in their work. And this is due very much to lack of training.

Nearly two years ago Mr. E. H. Parks wrote to a large number of concerns regarding the system employed in their respective establishments on this matter of apprenticeship. The results of these inquiries were published in *Cassier's Magazine*, October, 1902, issue. He received 112 replies, in which it was found that 17 concerns had no system and that but 49 require written agreements and 7 require deposits.

I appreciate the fact that the tendency of today is very largely to specialize among machinists, as well as among professional men; and there may be a feeling among some of you that there is not the demand for the all-round man that there has been. But I believe there is today a demand and an absolute necessity for a large number of these thoroughly trained men—men from whom we can select our foremen and heads of departments. In our own case, as I say above, we have consistently followed the system, and the result has been that we have been able to man our shop in its managerial departments very largely, in fact almost entirely, with men who have been trained with us as apprentices. The technical school is giving a training that will furnish, in many cases, engineers, but it does not pretend to give the technical training that is necessary to give us the workmen that we need; and without workmen we can hardly obtain the results that we are endeavoring to obtain.

We all know the old style of apprenticeship system; that the employer took the young man into his family, and he was called upon to build fires, run errands, take care of the children and any other odd job that might come along. After a given time he was put forth as a journeyman, to finish up his course by traveling around from one shop to another in order that he might obtain a finish.

Modern methods would not allow of this practice, and to attend to the work more satisfactorily we deem it necessary to have the boys indentured and to this end we have drawn up and make use of a printed form which is signed by the company, the apprentice and his parent or guardian. Taking up this paper, and following out the various items, we would say that as to age we find the limit, 16 to 18, to be a period that admits of their

*Read at the Worcester, Mass., meeting (June, 1903), of the National Machine Tool Builders' Association.

finishing their course before they have become too far advanced in age and consequently less amenable to instruction and discipline. That they must be physically sound goes without saying, for it is purposeless to train up young men who are not going to be able-bodied, as the time given to them is entirely lost. We have been obliged to pay some attention to education. I well know that it is not necessary for a good machinist to be able to know when Washington crossed the Delaware or when the Louisiana Purchase was consummated; but if we are to bring up a class of young men who are to be true representatives and men from whom we can draw for our foremen and managers, they must have some idea of learning and a love for study. We have required the equivalent of our grammar school course, which presupposes that they know enough of mathematics to know the rule of three, have some idea of decimals, the metric system, etc. Like any education, it is not so much what the boy knows that we are looking to as it is to what he has been trained to, which makes him a much more apt pupil in the shop.

Very often we are approached by young men who think they want to learn a trade and their parents wish to have them, who would be utterly unfit for such a work and really have no idea what it means. To indenture such a person would be unjust to all parties, and we therefore have provided a term of trial consisting of 480 hours. If during this time we consider that we wish the young man and he wishes to stay with us the papers are then signed, and these 480 hours are reckoned in with the first year's time. The apprentice must complete 295 days of actual work in a given year before he can start upon the year following, and his pay is regulated strictly according to this record. The company reserves the right to make such adjustment in the apprentice's time as they may see fit by reason of a difference in running time, as for example, short time or unforeseen breaks.

The only rule that we endeavor to maintain is to treat them all alike. As to the right to discharge for improper conduct, this is done only after all means have been exhausted to endeavor to bring the apprentices into line, and in this respect I believe that they have all been treated very fairly. Cases have come up where the court has been called upon to act upon our decisions, but we have been upheld in them.

As to the prices paid, 6, 8, 10 and 14 cents per hour for the respective years, I would say that in addition to this from time to time the apprentices are allowed to have piece-work to help them to make whatever they can over and above their regular pay. The work is divided practically as follows:

1st Year.	Lathe work, single tools	40	weeks
	Lathe work, double tools	10	"
2d Year.	Drilling	6	"
	Milling	12	"
	Assembling	26	"
	Erecting	6	"
3d Year.	Erecting	20	"
	Screw cutting	10	"
	General work	20	"
4th Year.	General work	35	"
	Scraping	3	"
	Planing	12	"
	Total	200	"

It is necessary to consider the work that is done, as any educational work is done. It is not possible to turn out men who are finished products in any one line; but it does give them an idea of the general run of work so that they are able to take hold and specialize later should conditions require it.

One element that I believe is quite essential, is that some one person should have charge of the apprentices. This is an idea that Mr. Richmond Viall held for a long while but was not able to carry it into operation as early as he wished, as the foremen who had to do with the boys felt that they did not wish to be interfered with in this way. The system has been inaugurated, however, and I believe that not one of the men who have to do with it would care to return to the old system. Under the old system every boy was taught to do a piece of work as the one who had him working for him saw fit to teach him. As to the grinding of tools, the drilling of centers and like work, there would be as many different ways of doing it as there were men who had the apprentices in charge. And apprentices are often neglected because the foreman, or some other person, is too busy to attend to them. Given an instructor of apprentices, however, it is his duty to see that all are instructed in the same manner to do a given piece of work, that time is taken for it and to do it properly; and then the general line of work is carried out under the supervision of the various foremen. This instructor of apprentices is also able to look out for those who are away from home, and in cases of sickness or where they may need attention outside of working hours he is at liberty to follow them up and to act for the company on behalf of the parents or guardians of the boys. Where there is a small number of apprentices I appreciate the fact that it would not be feasible to have one man devote his time to this work; but I believe that a man could be selected, a part of whose duties would be the care of the apprentices.

In closing, I am aware that the scheme that has been successful with the Brown & Sharpe Mfg. Co. would not lend itself to all localities and to all conditions, but I do believe that it contains food for thought on your behalf, and I trust the time is not far distant when all may have some form of apprenticeship in their shops that will help us to have a class of men in whom we can have confidence and who will be of material aid to us in our undertakings.

Pawling & Harnischfeger, of Milwaukee, report that in view of the generally good business conditions of the last six months past, and those existing, they are not apprehensive of any material change. There appears to be no let-up in the demand and they believe the volume of business to be contracted for during the remaining six months of the year will be large, and possibly equal to the six months past. The month just closed has been generally satisfactory, and among the crane orders entered are the following: Pittsburg & Montana Copper Co., Butte, Mont.; Chapman Valve Mfg. Co., Indian Orchard, Mass.; Pratt & Letchworth Co., Buffalo; New York Edison Co., New York City; Metropolitan Street Railway Co., Kansas City, two specials; A. & F. Brown Co., Elizabethport, N. J.; Standard Oil Co. of New York, Atlas Works, Buffalo, two cranes; Kelly & Jones Co., Greensburg, Pa., two cranes; Standard Steel Works, Burnham, Pa.; Allis-Chalmers Co., Gates Works, Chicago; Edward Ford Plate Glass Co., Toledo; Ingersoll-Sergeant Drill Co., Easton, Pa., four wall cranes and one double extension crane; Lobdell Car Wheel Co., Wilmington, Del.; Atlantic, Gulf & Pacific Co., San Francisco; Gisholt Machine Co., Madison, Wis.; Singer Mfg. Co., Elizabethport, N. J.; S. M. Jones Co., Toledo, two cranes; McConway & Torley Co., Pittsburg. The company will build an entire new plant, which will be located on National Ave., near the Milwaukee city limits. The details are not completed, but it is expected that work on the new shops will commence at no distant date.

George McNaul & Co., the Federal Galvanizing Co., Ltd., and the Standard Galvanizing Co., all of Philadelphia, have consolidated, and will hereafter operate under the name of the United Galvanizing Co. with the following officers: George McNaul, president; H. J. Maroney, vice president; Charles P. Horr, treasurer; and G. Eugene Harlem, secretary. A new plant is now being erected on Front St., extending through to and including the present plant of George McNaul & Co., at Nos. 520-524 Beach St.

The company to be known as the Shenango Steel & Iron Co. is soon to be organized to take over and improve the Continental plant, Wheatland, Pa., which was sold a few weeks ago. Plans for the operation of the plant by the new company have not been decided upon in detail.

Jigs and Fixtures for Interchangeable Manufacturing.

BY JOSEPH V. WOODWORTH.

In jig and fixture work there are six highly important factors to be considered: 1. The course the work is to follow during manufacture. 2. Locating and securing the work in the fixtures. 3. Keeping the locating points for the work free from chips and dirt. 4. Self-contained tools. 5. The class of help that will use the tools. 6. Convenience and ease in handling the tools during their operation.

Taking the first factor, the course of the work during

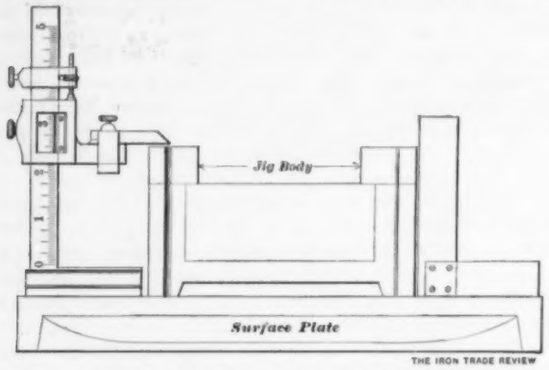


FIG. 1.—TESTING THE JIG BODY CASTING AFTER MACHINING.

manufacture: We will say that a part of a machine is given us, to design tools for its production in repetition. Say that the part, in order to complete it, will have to go through two operations, drilling and milling. The question is, which should be done first, the drilling or the milling?

In most cases, where the part is to be drilled and milled, it is best to provide for doing the milling first; because it is desirable that the drilled holes and milled surfaces shall have a certain definite relation to each other, and by having the holes drilled from a milled surface greater accuracy and interchangeability in the parts can be obtained. However, to settle the question, a "working point" or "surface" must be decided upon. Whether the part to be machined is a casting or not there is always one point which from its position in relation to others,

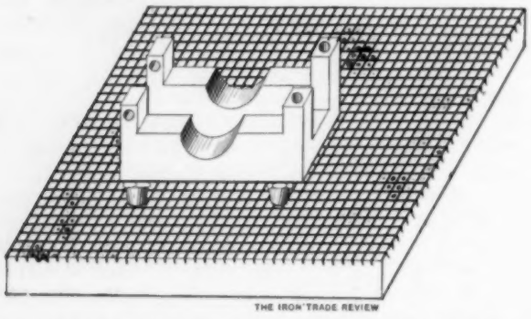


FIG. 2.—LAPPING THE HARDENED FEET OF A BOX JIG ON A FLAT PLATE V-GROOVED FOR EMERY.

should be taken as a "working point"—a point to refer to in all subsequent operations required to manufacture the particular part. The point chosen may be a hole, a plain surface, a slot or a lug or a boss; it matters not.

The Locating and Holding Devices.

Having chosen the working point, it follows that this is to be machined first, and that the first jig or fixture to be made is the one for this operation. This is the secret of successful jig making. Also use this point for locating the work in the different jigs and fixtures for subsequent operations. Never change a working point; as performing one operation from one point and the next from another is not conducive to good results.

When designing fixtures for drop forgings, turned work, punch blanks, or any part that has been previously put through a cutting, abrading, compressing or forming operation, the contour of the part is usually such that holding it is a simple matter; especially if the first operation is to be a milling one. With castings, however, through their lack of uniformity in many cases, fixtures of intricate and costly design are required, thus necessitating considerable care and judgment in devising the locating and holding means. If, instead of milling, it is decided that the drilling should be done first, and that the holes so produced are to be used in locating and securing the work instead of using the outline, it will be found that a simpler and less costly fixture can be used. Whichever course is decided upon, the fixture should be so designed as to allow of all operations of one class being completed before commencing another class.

Locating and securing the work quickly, accurately, and easily are factors of the greatest importance; the efficiency of the finished work depends more than anything else upon them.

One of the most essential conditions necessary to the accurate and rapid production of work in jigs and fixtures is convenience in keeping the locating points free from dirt.

Tools should be self-contained; that is, all devices and means utilized in locating and securing the work should be component parts of the tool. When this is the case the operator is not obliged to use a hammer, wrench, or any other tool in order to operate the fixture. When the designer is confronted with the problem of devising means for expeditious drilling of parts or castings in which the degree of variation need not be very slight, the first thing for him to know is the maximum degree of variation allowable in the finished work—in other words, the degree

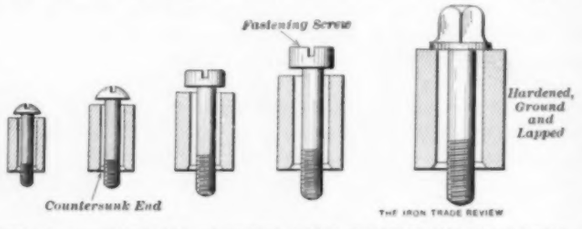


FIG. 3.—BUTTONS FOR LOCATING DRILL BUSHING HOLES IN DRILLING JIGS.

of interchangeability required. This point fully considered and the jigs designed accordingly, unnecessary labor and expense are avoided.

In constructing drilling jigs of simple design, for handling work which has been previously machined by milling at one or more points, or for castings which have not had any previous machining, the following points must be regarded: Have the jig body patterns made so that openings will be left in the castings in as many places as possible, without affecting the strength or rigidity of the bodies when in use; so that there shall be easy egress for the dirt, chips, etc., resulting from the drilling. For locating, provide for spots in the castings which may be readily and easily surfaced when machining. Lastly, the jig should be so designed that the work may be easily and rapidly located and fastened, drilled, and then removed. This is an important point, as the cost of operations depends on it.

After the preliminary work of machining all outside points on the jig bodies, comes the choosing of locating points and surfaces. First, choose a machined surface or surfaces of the work to be drilled. When this is not possible select points in the castings in which it is expected that the minimum of variation will occur. For fastening the work within the jig, provide means which will allow of being expeditious and positive in action and as simple as possible. And as the number of simple and inexpensive devices for doing this are great, it should not be difficult to attain satisfactory results.

It will be well to impress upon the designer and pattern maker the necessity of dispensing with excess metal at all unnecessary or unmachinable points, leaving ex-

cess metal at the locating and squaring points only. It is a fact well known to tool room foremen and to toolmakers in general that the habit of leaving unnecessary surfaces to be machined is quite prevalent.

Various Processes Illustrated.

In the production of interchangeable castings and machine parts of the utmost attainable accuracy it is, of course, necessary to use jigs and fixtures which are both positive and very accurately made. In such jigs, locating and finishing the drill bushing holes is the most delicate and accurate part of the work; and in order to accomplish it successfully the toolmaker must be skillful and familiar with the best practice.

Let us say that we have an accurate jig to construct; in which a number of bushing holes are to be located and drilled from various sides. Suppose that the jig body is a casting of the box type, which is the most usual. First, we machine all sides and bearing surfaces, including the feet, by either planing or milling, being careful to get them square and true with each other. Then we rest the jig body on a surface plate, as shown in Fig. 1, and test the various sides with square and height gauge, scraping the feet surfaces until they are at perfect right angles with the sides of the jig body. If the feet are of steel and are screwed in after hardening, as is frequently the case, they should be lapped on a flat lapping plate, such as is shown in Fig. 2, until the desired accuracy is an accomplished fact. This preliminary work on an accurate jig is the basis for the attainment of all accurate results; and unless accurately accomplished the possibility of perfect interchangeability in the parts machined in the jig subsequently is impossible.

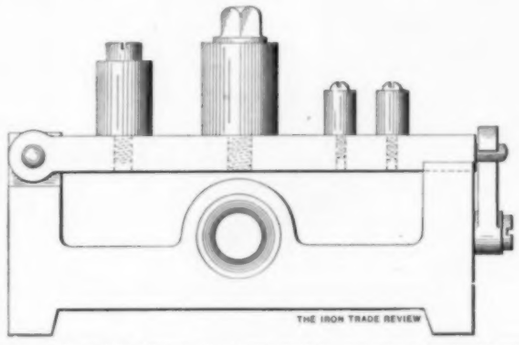


FIG. 4.—LOCATING DRILL BUSHING HOLES ON JIG LID BY BUTTONS.

Next come the laying out, locating, and finishing of the drill bushing holes. A number of methods are in vogue among toolmakers, some of which allow of fair results being attained. One method is for small and medium sized jigs and the other for large jigs.

For the small and medium sized jig the best method to use, and the only reliable one, is that known among mechanics as the "button method." First, a number of buttons are necessary. These are as shown in Fig. 3, being of standard sizes such as 5-16-inch, ½-inch, ¾-inch and 1 inch in diameter, according to the size of the bushing holes they are to locate. They are made of tool steel and are finished to length ranging from ½ inch to 1¼ inches and have a hole through them large enough to allow about 3-64 inch clearance for the button head screws which fasten them to the jig surface. They are hardened, ground and then carefully lapped on the outside to the exact size, and ground on the ends so as to be perfectly square; one end being slightly countersunk so as to insure the "button" resting square against the jig surface.

In using the "buttons" for locating the bushing holes, the latter are first approximately located by using the dividers, and then prick punching them. After this they are drilled with a small drill and tapped for the button fastening screws. Locating the holes positively is next in order. First, a button is secured in position by a screw, by working from two sides of the jig body, using a B. & S. height gauge. When the accurate location is secured fasten the button securely by its screws. The next hole is located in much the same manner, except that measurements are taken from the sides of the first button as well as the sides of the jig body, using two measuring tools, the height gauge and a vernier gauge. Considerable care is necessary to get the two buttons the exact required distance apart; but as the holes in the buttons are considerably larger than the fastening screws a slight tap here and there accomplishes this without loosening the screws. We then proceed in this manner until buttons to the full number of holes required are in place on the jig body, as shown in Fig. 4.

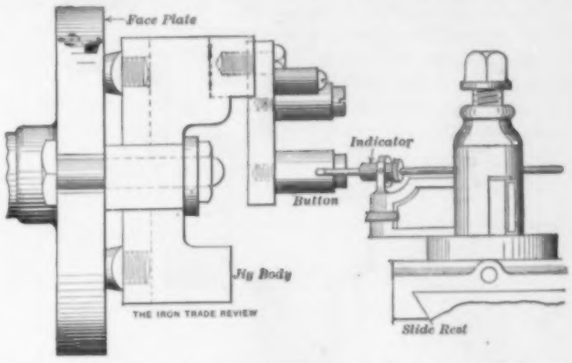


FIG. 5.—LOCATING JIG AND TRUING A BUTTON ON LATHE FACE PLATE WITH INDICATOR.

As we now have the buttons set to the number of holes required we may proceed with the boring and finishing of the bushing holes. First, we clamp the jig body on the face plate of an accurate lathe, being very careful not to spring the casting. Then we true the first button by means of a center indicator, in the manner shown in Fig. 5. When this is accomplished we remove the button and the indicator from the toolpost and insert a small boring tool with which we enlarge the screw hole to almost finish size; then use a finish boring tool and carefully size and hole. Next we shift the jig body until the next button is running approximately true. True it perfectly by the use of the indicator; and then re-

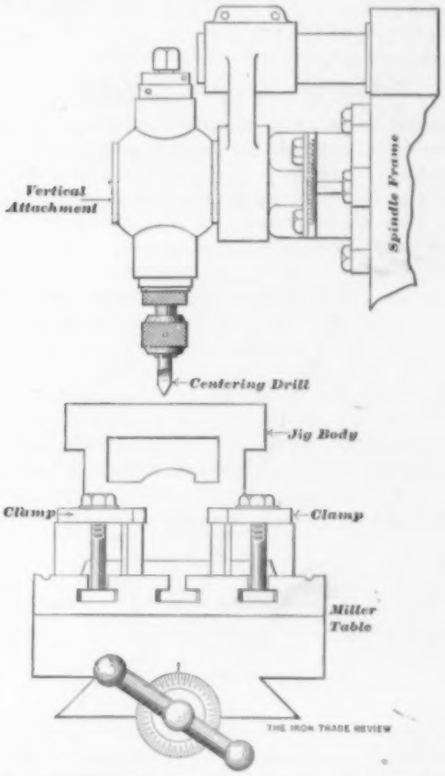


FIG. 6.—LOCATING DULL BUSHING HOLES IN LARGE DIE BODIES ON UNIVERSAL MILLER — CENTERING.

peat the other operations of boring and finishing to size. We then proceed in this manner until holes to the full number of buttons in position are bored and finished. By this method a jig of the greatest attainable accuracy may be constructed with the positive assurance that the results in the finished parts will be accurate. If the toolmaker is skillful, and a close worker familiar with accurate work, he will be able to accomplish these foregoing results without worry or trouble.

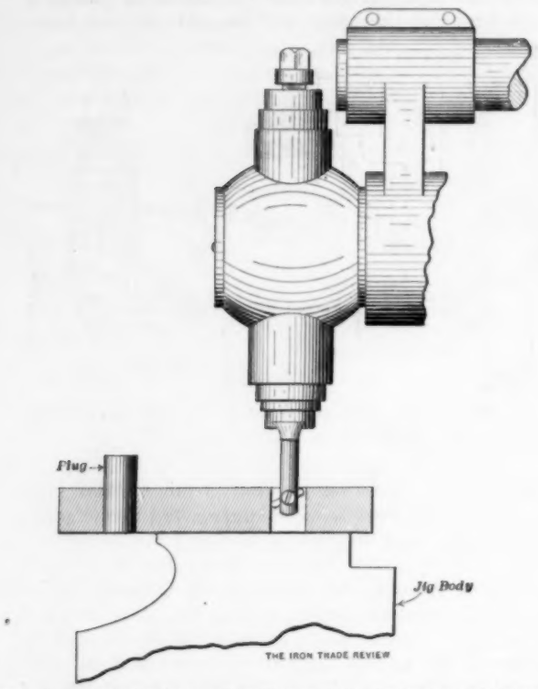


FIG. 7.—BORING DRILL BUSHING HOLES BY VERTICAL ATTACHMENT.

Patterns for Castings to be Jigged.

Castings or parts to be machined must be of uniform size or shape, as otherwise the precautions taken in making the jig will be ineffective. It will be well to have the patterns of metal, finishing them at all points to the size required, plus the amount lost by shrinkage, and of course allowing for surplus stock at all points which are to be machined previous to the drilling operation. Most of the trouble experienced in the manufacture of interchangeable parts by drilling can be traced to faults in pattern making or poor molding. When perfect patterns are made and good molders work from them, there will be no doubt of the results in the finished work, providing the jigs are accurately made.

It is well to keep in mind the following points, in order to insure a perfect result: Make all parts of accurate jigs sufficiently strong and heavy; so that all strain to which they may be subjected when in use will be overcome. Make the locating of the work within the jigs positive, so as to eliminate the possibility of shifting during the operation of the tools. For instance, it would be ridiculous to use a device of the same strength for fastening and locating a piece in which a 1-inch hole is to be drilled as would be used for holding a piece in which a ½-inch hole is desired. Lastly, utilize means and points for fastening and locating the work within the jigs and against the locating points, which will be at once such as to allow of rapid manipulation and in no way interfere with expeditious operation.

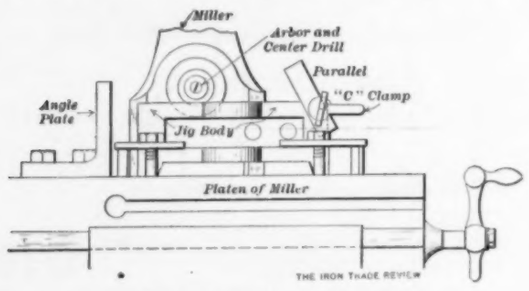


FIG. 8.—JIG WORK ON PLAIN MILLER.

The second method for locating and finishing bushing holes pertains to large jigs. As a rule the castings of jigs for machining heavy parts are of considerable size and weight. It is not always possible to swing them on the lathe faceplate and finish the bushing holes by the "button" method; as the cumbersome shape and unusual size of the body castings interdict the accurate and positive locating of the buttons, and make the task well nigh impossible. We are forced to adopt other means which will allow of accomplishing the result in an easy manner. To do this we use a universal milling machine which is equipped with a vertical attachment. First we strap the jig body on the table, and then locate the holes by using the cross or longitudinal feed screw graduations, the vertical feed, a pair of 12-inch verniers, and a B. & S. height gauge. The actual work is accomplished by first locating and finishing the holes in the upper surface of the jig body, using a small drill chuck as shown in Fig. 6, located in the socket of the vertical attachment, and a short stiff centering drill. We space, center and drill the holes to the number required in their approximately correct position, leaving them somewhat under size and in their accurate location to each other. To size and finish the holes, a spindle should be turned to fit the socket of the vertical attachment and a small cutter inserted in the protruding end of it. Thus we have a small boring bar as shown in Fig. 7. We next determine the distance from the side of the boring bar to the working side of the jig body with the verniers. We deduct one-half the diameter of the boring bar and then move the table by means of the cross or longitudinal feed screws the distances required in thousandths, and bore the hole to the finish size. The hole being finished we make a plug and fit it to the hole and insert it, and then finish the remaining holes by working from the plug and the side of the jig, measuring with the verniers from the side, and from the base with the height gauge. Afterwards we may drill and finish the holes in the other sides of the jig body in the same manner, merely reversing the jig body or removing the vertical attachment, and centering directly from the miller spindle, as may be found convenient.

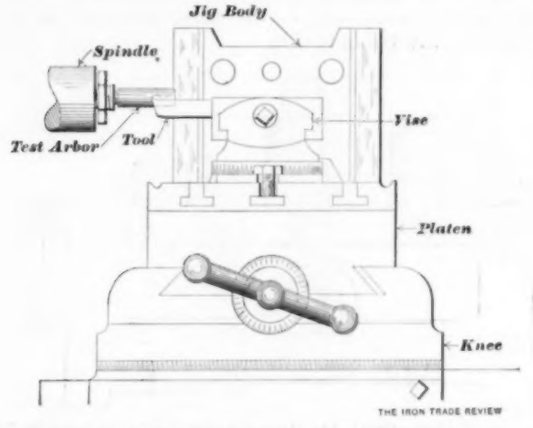


FIG. 9.—TRUING TEST ARBOR WITH TOOL HELD IN VISE ON MILLER PLATEN.

While the most satisfactory and accurate results in jig making can always be attained on the lathe face plate by the "button method" or on the table of the universal milling machine by the vertical attachment, as described in the foregoing, and jobs can be done that would be well nigh impossible of accomplishment by other means, it must not be inferred that the plain milling machine is limited in its sphere of usefulness in jig making. Practice has proven that this machine tool possesses considerable utility in this line.

As the greater number of jigs required are rectangular and have the bushing holes let in parallel with the sides

and not infrequently the bushing holes are located in all sides of the jig body, with each side used in turn as a bottom to set the jig on in drilling from the opposite side, it will be apparent that a large part of the work necessary to construct the tool can be conveniently done on a plain miller with a table that can be adjusted vertically. We will say that we have a jig to make with bushings let in from two parallel sides. First we square and scrape the bottom locating surfaces and then clamp the jig body on the plain miller table, setting it square with the spindle and as far from it as possible, so that we may have ample room between it and the work. In some cases it may be expeditious to clamp an angle plate to the platen at one side of the work square with the spindle, so as to assist in locating the first hole and proving the work as we proceed. If holes are to be put in all of the different sides and the jig is clamped for locating the holes in the second side, the toolmaker can establish without trouble the correct relation between the holes by taking distances from the angle plate to plugs inserted in the holes first bored, as per Fig. 8. When the distance from the first hole to the side of the jig is determined, we add the distance the jig is from the angle plate and thus determine how far the first hole is from the angle plate. With the rest of the work there are a number of ways to follow; but the most practical is to use the height gauge to measure all distances. Another that is almost as good is to insert an arbor in the miller spindle and feed the table forward until a piece of tissue paper will just draw out between

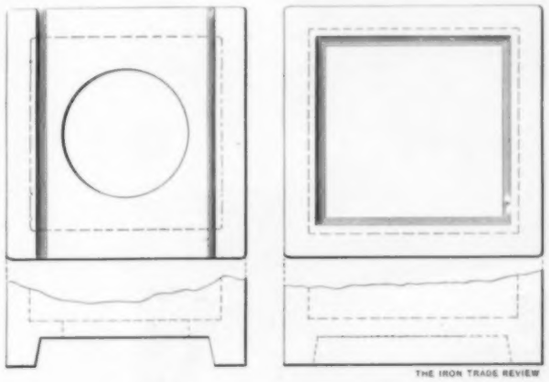


FIG. 10. FIG. 11.

FLAT BASE TYPES.

the arbor and the angle plate. Then by means of the dial on the longitudinal feed screw run the table forward the required distance. When the screw on the machine has been determined to be correct one can depend on the dial almost wholly for the vertical spacing; while the platen can be set by calipering to the arbor in the spindle.

In doing jig work on the plain miller a parallel can often be clamped to the side of the jig from which measurements may be taken. After the work has been located in place on the table a miller vise may be clamped to the platen and a diamond point tool clamped in it, with which the test arbor in the spindle may be turned true, as shown in Fig. 9, finishing it to a size convenient to use in locating the work both horizontally and vertically. Then again, a turning tool may be clamped to the back edge of the table with a parallel spanning the distance to the first slot in the table, and in this way true a piece of stock which may be held in a chuck in the spindle. Any toolmaker who has done jig work on the miller will appreciate the advantage and help of having a test piece in the spindle running perfectly true; and that in order to accomplish accurate work it is necessary to have all conditions equally accurate and reliable as the job progresses.

It is sometimes necessary to bore a bushing hole in a jig at an angle with one of its sides. To do this correctly on the plain miller we can set the jig body at the given angle with the angle plate—which has first been set square with the spindle—and a bevel protracter.

When work is to be handled that is larger than the capacity of the milling machine platen, it is only necessary to provide an auxiliary platen almost as long as the machine table and about twice its width, and bolt it to the machine. This emergency table should be provided with a number of slots or holes for fastening the work to it. Accurately made parallels which just fit the slots in the table are of great convenience in setting such large work; while a block with a tongue to fit the slot and nearly as wide as the table and with its edge milled accurately in line with the spindle axis is also a help.

After the jig is located and ready for letting in the bushing hole (whether on the lathe face plate or on the table of the universal or plain milling machine) finishing should not be done with drill or reamer, for there will not be one chance in a thousand that the hole will be accurately located. The hole must be bored to a finish in order to do a correct job.

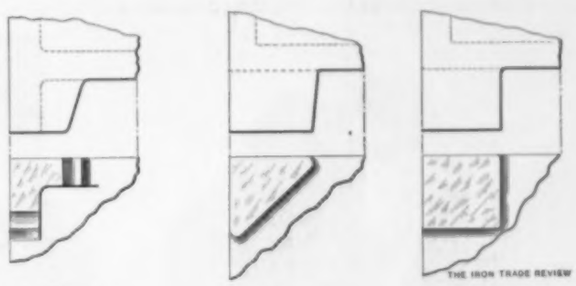


FIG. 12. FIG. 13. FIG. 14.

TYPES OF CAST JIG FEET.

The proper feet for jigs are largely a matter of individual taste. There are, I believe, quite as many kinds of jig feet as there are jig designers. Some even go so far as to prefer having no feet at all on their jigs, and thus obviate the possibility of trouble with the drill press table slots.

Figs. 10 to 18 show a number of different kinds of jig feet. Figs. 10 and 11 are flat base types; Figs. 12 to 14, cast feet on base of jigs. Any of these make good feet, the one shown in Fig. 12 being, of course, easier to make and just as good as the others except where a foot of considerable length is necessary. With steel feet all sorts and sizes are used and give satisfaction. Figs. 15 to 19 are types.

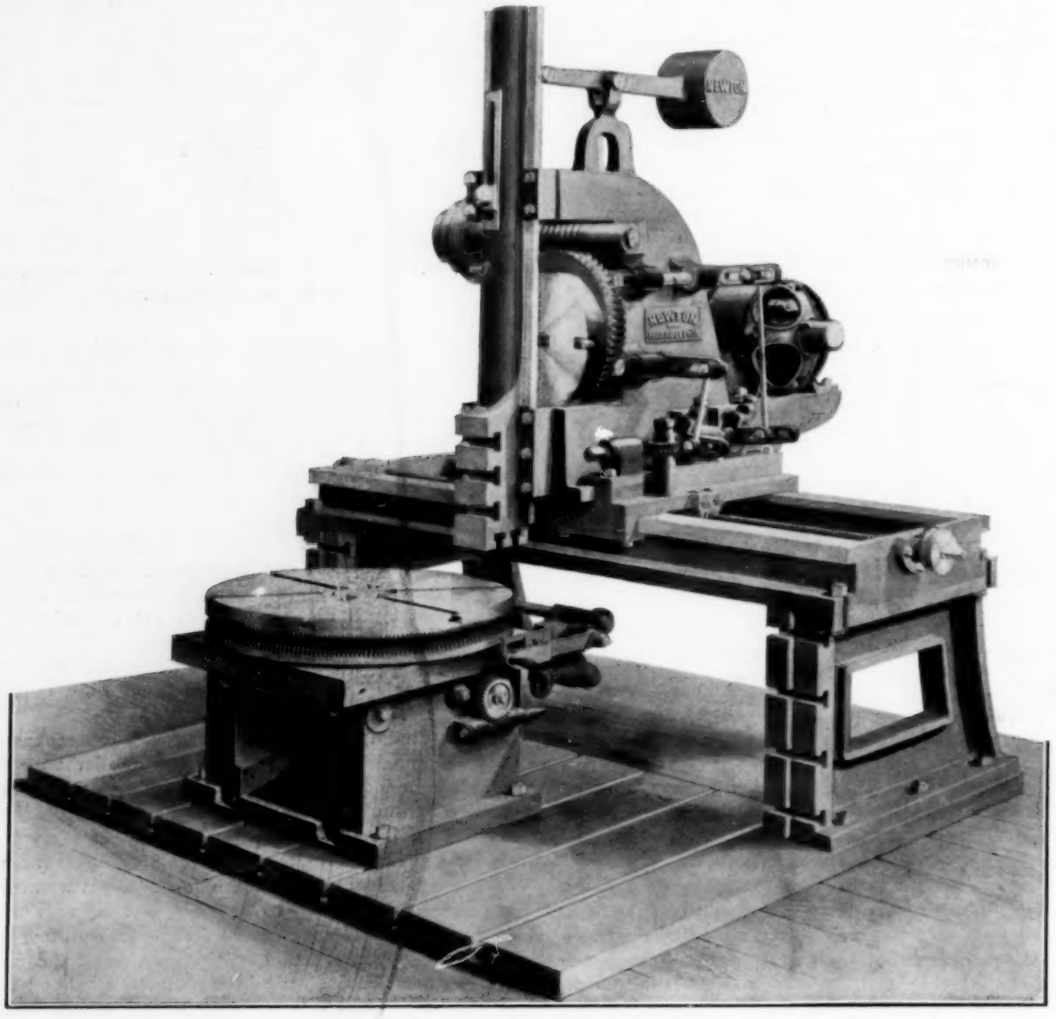
In concluding it may not be amiss to emphasize the advisability of becoming practically familiar with the installation and operation of the interchangeable system of manufacturing. To demonstrate the necessity of mastering the details of the system, it is only necessary to point out that in the manufacturing machine shop of the present day, the efficiency of the machines or parts turned out can usually be judged by the use that is made of properly designed and constructed drilling and milling fixtures and jigs for the production in repetition of the most accurate operations of the work. Although it has been, and is still, possible to obtain satisfactory results without a large outfit of such tools, no shop can produce interchangeable parts, or duplicate machines in large quantities and sell them at a price which will compete in the open market, unless it has an adequate equipment of special jigs and fixtures, and a man at the head who thoroughly understands their design, construction and use.

FIGS. 15–19.—STEEL JIG FEET.

The Shepherd Engineering Co., manufacturer of the Shepherd steam engines, will have its general offices and works at Franklin, Pa., where it has secured the large and modern plant constructed a few years ago by the Grant Tool Co.

A NEW SLOTTING MACHINE.

A new design of the Newton slotting machine has just been built, so arranged that it can be used either as a fixed or portable slotting machine. It is motor driven and has a three-step cone for variable speeds. Power is transmitted to a driving cone by means of worm and worm wheel, adding power to an already powerful machine. The ram has a stroke of 16½ inches, is counterweighted and has a quick return. The carriage has a variable feed motion in both directions, and longitudinal feed of 6 feet by means of a rack and pinion. It is also supplied with a screw which has a graduated disc on the end for use in rack cutting and all work of that description, the nut being so placed that it can be readily removed whenever desired, to use the automatic feed lengthwise on the bed. There is a transverse adjustment to the head of 5½ inches.



A NEW SLOTTING MACHINE.

Another feature is the auxiliary work table shown in the illustration. It has a circular table 38¾ inches in diameter with a dividing index device for gear cutting, angular work and all dividing work in general. This table has a fixed bearing at one end, and a worm wheel segment on either side, by means of which it may be raised vertically to any desired angle up to 90 degrees, thereby bringing the table parallel to the ram, covering a wide range of work. The auxiliary table is clamped to a floor plate 8 feet 10 inches long by 4 feet 6 inches wide, and can be removed whenever desired to admit larger work, as the machine has a distance of 28 inches from the floor plate to the under face of the rail.

When it is desired to use this machine for portable work the rail and slotting machine proper are released by loosening the bolts at either end of the rail connecting it with the legs. The manufacturers are the Newton Machine Tool Works, Inc., of Philadelphia.

Cincinnati Water Pipe Contract.

The contract to supply the Waterworks Department of the city of Cincinnati with water pipe, water pipe specials and loam castings aggregating 3,200 tons was awarded on June 26 to the Dimmick Pipe Co., of Birmingham, Ala., at its bid of $41,200. The other bidders were the United States Cast Iron Pipe & Foundry Co., $45,000; Massillon Iron & Steel Co., $55,750. The United States Cast Iron Pipe & Foundry Co. heard after the bids were opened, that the Dimmick Pipe Co. had made the lowest bid and wrote a letter to the board of public service which was received before the contract was awarded. The letter stated that the Dimmick Pipe Co. had bid below the present market price of pipe, probably anticipating a reduction; that it probably had not figured on shipping in less than carload lots, as the United States company did, and that if the board would re-advertise the work within the next forty days a guarantee was given that the price the United States company would give would be as low as or below that of the Dimmick Company. A certified check was enclosed as a forfeit in case it failed to keep the agreement. The board simply filed the letter and awarded the contract to the lowest bidder.

The Sterling Foundry Co., Sterling, Ill., is a prosperous institution which is doing a jobbing business in gray iron castings. It is putting several specialties on the market including the "Best" tank heater and its improved Japan and enameling oven stove which has been satisfactorily tested by a number of manufacturers.

Points for Shop and Power House.

BY ROBERT GRIMSHAW.

Three-Legged Lathes.

There was a long time ago a proposition or suggestion made by Prof. John E. Sweet to facilitate the leveling of lathes, by giving them only three legs instead of four ; but up to date, it seems to remain unheeded. The advantage of having not only lathes but other machines stand on or be supported by three points instead of four is that, as any one can see in the case of a three-legged stool or table, no matter how uneven the floor may be—I use the word "uneven" as distinguished from "out of level"—no amount of shaking can result in tipping the object. Blocking up of one leg is unnecessary. When, however, a heavy machine, as a lathe, has four legs, and is set on an uneven floor there is a tendency for the frame or bed to spring, in order to allow the leg that would otherwise remain unsupported to reach the low place in the floor ; and, in the case of a lathe, such twisting is fatal to accuracy of work.

Automatic Feed-Water Purifier.

The impure water enters at W, which has a controlling valve G, into the automatic "tip" K, from which it goes to the separating chamber F. The "medicine," which is chosen according to the analysis of the impure water, flows through the submerged pipe C from the closed reservoir B to a side chamber of the tip-box K (Fig. 2) out of which it is scooped by the spoon O, the handles of which are fast on the shaft of the tip. Thus the "medicine" is spooned out according to the patient's need. The medicine flows through the pipe L into a "fore chamber" of the separating chamber, where it meets the impure water ; the mixture being warmed by the steam jet J. Most of the mud is deposited in this fore chamber. The rest in the clearing chambers. The purified water flows through the pipe H into the collecting and settling chamber P, where the rest of the heavy mechanical impurities are dropped ; then through N to pump or injector. The mud is blown off through S. The "medicine" is mixed in the reservoir M and thence delivered by its steam-jet pump E to B.

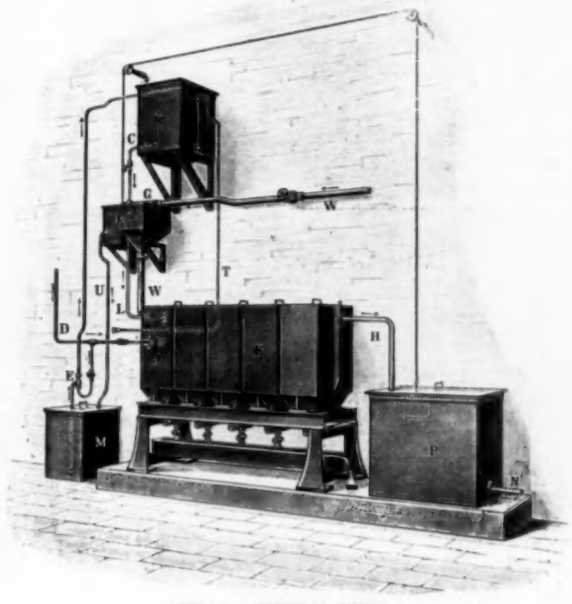


FIG 1.—GENERAL VIEW.

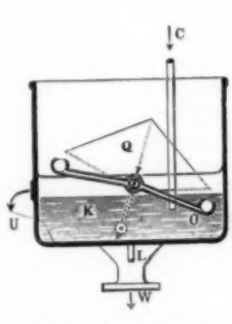


FIG. 2.—CROSS SECTION OF TIP.

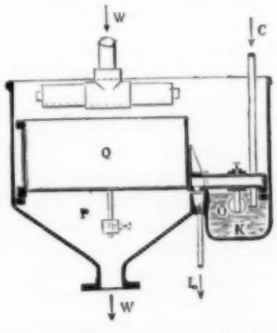


FIG. 3.—LENGTHWISE SECTION OF TIP.

The pipe line U is for return of the lye to M. T is an air bleeder. In the cooling chamber there is a float which is by a rod so connected with the shut-off G in the water supply pipe that when more water is needed the supply is increased and *vice versa*.

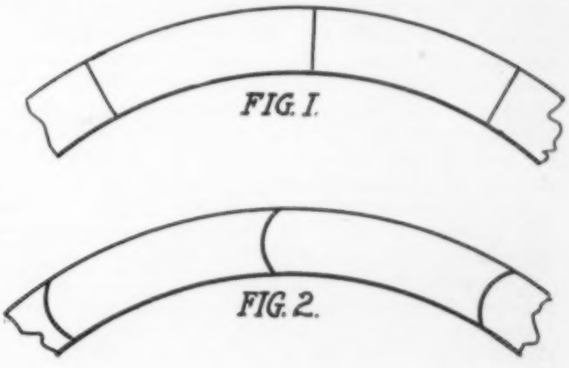
Fig. 1 is a general view, Fig. 2 a cross section of the "tip" and Fig. 3 a lengthwise section of this latter.

Pipe Vise.

The cut shows a German pipe vise and stand which has some good qualities upon which American inventors can doubtless improve. There is an inclined malleable iron tripod frame having between the legs a shelf for dies, etc., and two of the legs of which are fast to a foot plate on which the workman stands so that the whole is held fast. The weight is 19 kilograms—41.8 pounds—for pipes up to 2 inches diameter. The makers are Delisle & Ziegele, of Stuttgart.

Laying Up Wooden Pulley Rims.

A German firm, "which shall be nameless," but which evidently knows a good thing when it sees it, has adopted *in toto* the American idea of all-wood split pulleys with halved wooden bushings, but has somewhat improved on the usual manner of laying up the rims. Instead of a plain butting joint, as is usual in the United States, and as is shown in Fig. 1, this firm makes semicircular or partly circular end joints, as shown in Fig. 2, thus getting a better grip on the fibers with the glue.



U. S. CAST IRON PIPE & FOUNDRY CO.

At the annual meeting of the United States Cast Iron Pipe & Foundry Co. the annual report of the company for the year ended May 31, 1903, consisting of a balance sheet, was submitted. It shows:

Assets—		
Cost of properties	$24,066,167	
Add improvements and betterments during year	60,315	
		$24,126,482
Treasury stock, at cost		347,555
First mortgage bonds of American Pipe & Foundry Co., par value		306,000
*Sinking fund		68,037
Current Assets—		
Bills receivable	$ 32,912	
Accounts receivable	2,464,815	
Material, supplies, etc.	1,680,018	
Insurance, etc., paid in advance	6,096	
Cash	420,745	4,604,585
Total		$29,452,659
Liabilities—		
Preferred stock, issued		$12,500,000
Common stock, issued		12,500,000
First mortgage bonds of American Pipe & Foundry Co		1,500,000
Current Liabilities—		
Accounts payable	$1,112,720	
Accrued bond interest	29,850	
Accrued taxes, etc.	13,985	1,156,554
Reserve accounts—		
For working capital	$836,515	
For improvements and betterments in lieu of depreciation	105,836	942,381
Profit and loss account—		
Profits for fiscal year ending May 31, 1903	$1,370,542	
Deduct: Reserve for improvements in lieu of depreciation, $105,836; interest on bonds, net, $68,555	174,391	
	$1,196,151	
Add: Cash received for rights of way	16,825	
Dividends on treasury stock	15,748	
Net earnings	$1,228,724	
Deduct: Amount transferred to working capital, $546,718; †dividends, $500,000	$1,046,718	
	$182,006	
Add: Balance May 31, 1902	671,718	853,724
Total		$29,452,659

*For redemption of American Pipe & Foundry Co. bonds (72 of these bonds in hands of trustee).

†4 percent on preferred stock.

The net earnings of the company in the previous fiscal year were $711,184. There was, therefore, an increase during the past year of more than $500,000. The company now shows current assets of $4,604,585. This compares with $3,763,407 at the end of the preceding year or an increase of nearly $850,000. After setting aside $546,718 for working capital, and after dividends on the preferred stock, the company carries $182,006 to surplus account, which, as above shown, now stands at $853,724. Leading interests in the company state that in view of this showing and the fact that the company has no bills payable, they do not see how the suit to place the company in receivership, just instituted by a former director, can have any standing in court. A resolution was passed condemning the bringing of the suit.

The stockholders met in Burlington, N. J., June 25, and indorsed the management of the company, which had recently been attacked by A. H. McNeal, an ex-director. In regard to this attack the stockholders adopted the following resolution:

Resolved, That the stockholders here assembled, representing holdings of more than two-thirds of the capital stock, denounce the action of Andrew H. McNeal and his unwarranted attack upon the credit of this corporation. We have full and perfect confidence in the management, in the accuracy of the financial exhibit as made by the Audit Co. and in the absolute financial soundness and strength of the corporation. The quick cash assets exceed the current accounts payable four times over, and the name of the company is not upon a single discounted bill. The conservative policy of the management has been such that more than two dividends have been earned for each dividend declared. We urge the executive officers to vigorously defend McNeal's suit, not only for the purpose of winning it but for the purpose of disclosing the malicious purposes which have inspired his conduct.

The annual report of the president also contained the following reference to the suit brought by Mr. McNeal:

"The board of directors requests me, as the executive head of this company, to refer to the suit for a receiver recently begun by A. H. McNeal and to state that a little over a year ago, while Mr. McNeal was resident manager of the Burlington plant of this company, his connection with certain financial transactions was such as in the opinion of the board of directors rendered it undesirable for him to remain in charge of any of the company's property. We will not go into the details of this matter at this time. Suffice it to say that the facts were amply sufficient to justify the position of the board. Since his removal from the resident managership of that plant he has made strenuous endeavors to injure the company, including the institution of several suits. In none of these suits has he obtained any success up to the present time. These facts are, in the opinion of your board, the explanation of this suit for a receiver. But in view of the financial statement of the company it must be clear to all of you that the suit is merely a malicious proceeding and without merit. Indeed, I may say to you that this is the opinion of the company's counsel and of your board of directors."

The entire board of directors was re-elected for the ensuing year, and the board organized immediately afterward by re-electing the old officers.

A contract has been awarded to the Buffalo Dredging Co., by the Buffalo & Susquehanna Iron Co., the Buffalo & Susquehanna Railway Co., and the Pennsylvania Railroad Co., for the building of a canal 3,900 feet long, 200 feet wide and 23 feet deep, and the building of a slip canal 800 feet long, 150 feet wide and 23 feet deep, to enable the Buffalo & Susquehanna Iron Co. to unload ore boats at its new plant. The amount of the contract is to be in excess of $1,000,000. In addition to the facilities which it will give to the iron company, the canal will afford equal facilities to the Pennsylvania Railroad Co. for unloading freight.

At the semi-annual meeting of the Nova Scotia Steel & Coal Co., held in Montreal a few days ago, a financial report was submitted, showing that during the last six months the company had been earning almost 18 percent on its capital. The report showed that the entire output of the steel works and coal properties had been sold for the present year. Headway had been made on the new works next to the ore deposits of the company at North Sydney. The entire output of these works is to be taken to the works at New Glasgow to be rolled.

Manufacturing plants in Muncie, Ind., have recently had a great deal of trouble with natural gas on account of the low pressure. Superintendent Tyler of the American Rolling Mill Co.'s plant has been instructed by the officers of that company to experiment with the use of coal. The experiment is one of considerable importance to the gas belt, as it is doubtful whether the rolling mills can be operated profitably when using coal. Fear is expressed in Muncie and other Indiana cities that mills may be dismantled and moved to other localities where coal can be purchased at lower prices.

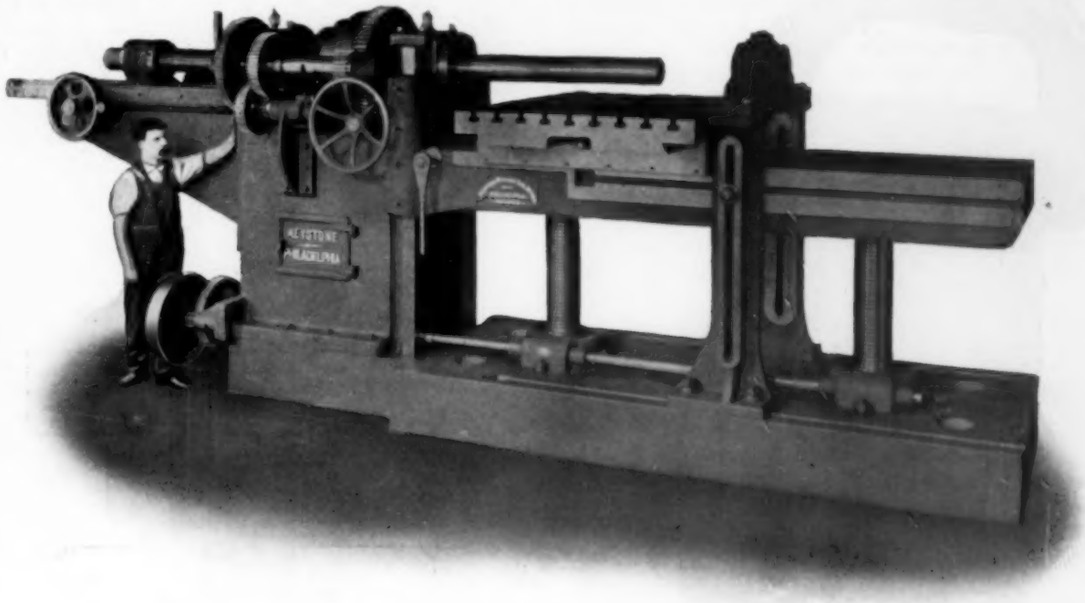
Walter S. Bent has been appointed receiver of the Star Mfg. Co., Wabash, Ind., manufacturer of gas engines. The assets and liabilities are nominally placed at $15,000 each.

HORIZONTAL BORING MACHINE.

The No. 4 horizontal boring machine built by the Keystone Machine Tool Co., of Philadelphia, has a capacity of 6 feet in diameter and a length of spindle feed from 40 to 80 inches.

The cone pulleys have five steps for a 4-inch belt and are double back geared, the combination giving 15 changes of speed to the spindle. The main spindle is made of a high grade cast steel and is 5½ inches diameter and 12 feet long with a No. 7 Morse taper hole in the end. The spindle can be rotated in either direction and has a power-feed either way without reversal of the rotary motion of spindle. There is also a quick motion obtainable by hand by means of a rack and pinion. There are eight automatic and positive gear feeds.

The table is 10 feet long and elevated or lowered by screws driven by power in either direction. The table has a saddle which has a parallel movement to the spindle and on the saddle there is a cross table which measures 48x60 inches with a horizontal movement at right angles to the main spindle.



A NEW HORIZONTAL BORING MACHINE.

This machine will bore up to 6 feet diameter and by removing the top tables a diameter of 7 feet 6 inches may be machined. Boring heads and facing attachments can be fastened to the boring bar at any point. A rotary table can be furnished and is then fitted to the cross feed carriage. Machines are arranged for either belt or motor drive, direct connected with gears or silent chain. The weight complete is 35,000 pounds.

Three prominent manufacturing companies will soon move from Brooklyn, N. Y. The Lidgerwood Mfg. Co., manufacturer of steam and electric hoists, will move to Newark, N. J., where a large plant is now in course of construction. The company employes 800 men in Brooklyn. The Henry R. Worthington Hydraulic Works, which employs 1,200 men, is about to move to Harrison, N. J. The Chrome Steel Works is building a plant near Carteret, N. J. These companies are seeking larger quarters and also complain that they have been greatly annoyed by frequent inspections by the city government of Brooklyn. High insurance rates and poor transportation facilities have also contributed to the dissatisfaction.

The South Chicago plant of the Illinois Steel Co. on June 25 turned out 1,894 tons of steel rails, breaking the record, which had been 1,772 for a day's work.

AMERICAN CAR & FOUNDRY CO. EARNINGS.

Net earnings of the American Car & Foundry Co. in the fiscal year ended April 30 were $7,059,900, an increase of $2,764,300, or nearly 65 percent over the net earnings of the preceding year. In the year the company raised the dividend on its common stock from 2 to 3 percent and still carried to surplus $4,059,900, as against $1,595,600 in the preceding year. Added to the previous surplus this makes a total of $10,730,453 as of April 30. The annual report states that the original working capital of the company amounted to $5,357,903, to which sundry additions since the organization of the company of $275,102 have been made, making $5,633,005; the surplus of $10,730,453 brings the total to $16,363,458. From this amount $2,693,770 has been expended for permanent improvements and real estate and included in "property account," leaving the working capital at the beginning of the current fiscal year, May 1, 1903, $13,669,688.

The old directors were re-elected at the annual meeting of stockholders in Jersey City, at which the figures were presented. Following is a statement of the earnings for the year ended April 30, 1903, with those of the preceding year:

	1903.	1902.
Net	$ 7,059,902	$4,295,602
Preferred dividend	2,100,000	2,100,000
Balance	$ 4,959,902	$2,195,602
Common dividend	900,000	600,000
Surplus	$ 4,059,902	$1,595,602
Previous surplus	6,670,551	5,074,949
Total surplus	$10,730,453	$6,670,551

The balance sheet as of April 30, 1903, compares as follows:

Assets—	1903.	1902.
Cost property, plants and other investments	$57,060,765	$59,118,183
Materials	13,133,803	11,915,129
Accounts receivable	9,613,587	7,461,953
Cash	2,463,056	1,571,458
Stocks and bonds other companies	1,813,863	.....
Total assets	$84,085,075	$80,066,720
Liabilities—		
Preferred stock	$30,000,000	$30,000,000
Common stock	30,000,000	30,000,000
Vouchers and notes payable	12,930,406	12,925,793
Pay rolls (paid in May)	424,215	470,376
Surplus	10,730,453	6,670,551
Total	$84,085,075	$80,066,720

A NEW BENCH PUNCH.

The Badger State Machine Co., of Janesville, Wis., has recently brought out a number of new tools; one of these is shown in the illustration. This is a bench punch weighing 150 pounds and having a capacity to punch a 5-16 hole in ¼-inch iron. The machine is designated the No. 7 and has three punches, each working independently of the others, an arrangement permitting three sizes of punch to be ready for use at the same time. The punch is so made that by inserting the sliding key in the different keyholes on the top of the machine, any one punch can be operated or the workman may, when this is desired, insert keys in all three holes when the punches may be in action at the same time.

NEW BENCH PUNCH.

The firm makes a general line of punches and shears of various sizes and built for hand or belt power.

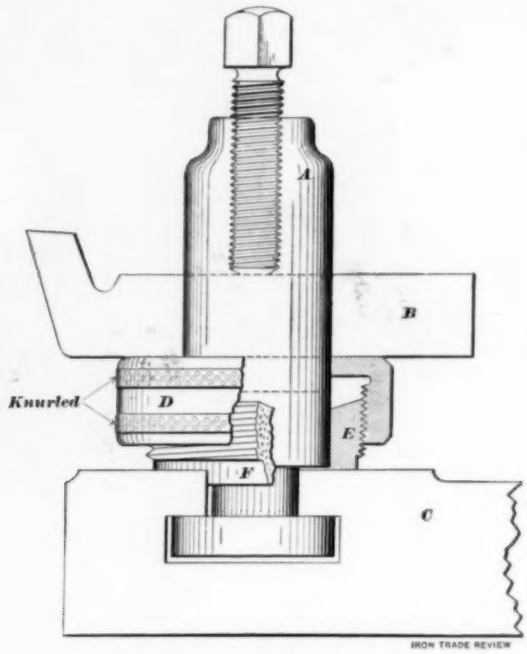
At the meeting of the board of directors of the United States Steel Corporation, to be held July 7, dividends for the third quarter will be declared on both the common and preferred. It is stated that the second quarter's earnings will equal, if not exceed, the earnings for the corresponding quarter last year, but will not be large enough to make up the falling off of $1,500,000 in the net earnings for the first quarter as compared with the first quarter of 1902. For the first half of the year the net earnings are expected to exceed $61,000,000 as compared with about $63,000,000 in the first six months of 1902. It is also expected that at this meeting a statement of the results of the bond conversion plan will be announced.

The American locomotives recently shipped to the Soudan Railways have been found not only cheaper in their initial cost, but they consume less coal and require less oil than the British engines used in that country.

NEW TOOL POST FOR LATHES.

The engraving is taken from a sketch contributed by F. C. Tyler, of Cleveland. The tool is already in use on a number of lathes having compound rests and is designed to take the place of the ordinary toolpost. Most lathes have a concave washer on the toolpost with a convex shoe through the slot, an arrangement which admits of a fair range of adjustment for most turning tools. The device is not nearly so convenient in the case of boring tools and in either case there is not the readiness of replacing the tool exactly at the same height after it has been removed for grinding or any other purpose. This point is of most consequence of course in boring a small hole to a considerable depth.

The device suggested to overcome any disadvantages of this kind consists of a post A which holds the tool B by means of a setscrew in the usual manner and slides in a T-slot in the rest C. There is an external ring D on which the cutting tool B rests, this ring is tapped to fit the threaded collar E. The collar D is knurled for ready adjustment and the part E has the upper face beveled in toward the toolpost with a view to keeping such chips and grit as should work in through D out of the threads. There is a shoulder F on the ring E which fits in the



TOOL POST FOR COMPOUND RESTS.

T-slot and prevents rotation of the inner collar.

The device is an inexpensive one and will maintain either turning or boring tools in a level position at different heights of adjustment.

The motion of John W. Granger and Andrew H. McNeal for a preliminary injunction to restrain the Cramp Company from increasing its capital stock and its mortgage indebtedness was heard June 26 in Philadelphia. The stockholders on June 25 authorized the company to increase its capital stock from $5,000,000 to $6,250,000, and its mortgage indebtedness from $1,200,000 to $7,500,000. Granger and McNeal, minority stockholders, contended that the plan of recapitalization would be contrary to the constitution of the State. They also claimed that the commission to be paid to Drexel & Co. is exorbitant.

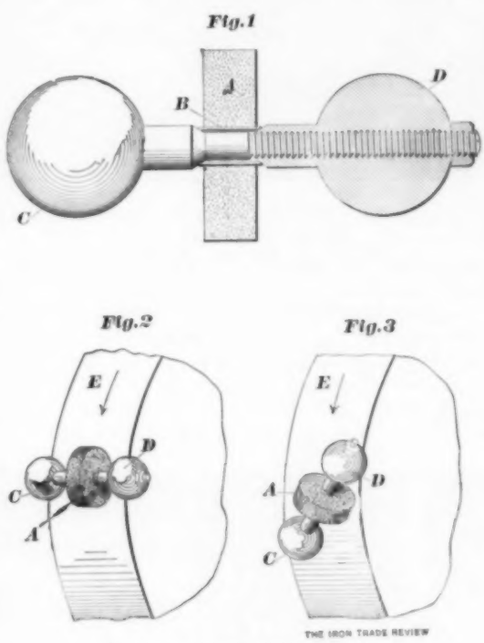
The Jefferson Structural Iron Works has been organized at Charleston, W. Va., through the efforts of the Charleston Board of Trade, and will be operated under the management of A. F. McCarty & Co., of Philadelphia. The building and machinery of the old Vulcan Road Machine Works have been purchased and a force of men put to work making repairs.

Some New Things for the Shop, Chiefly by Way of the Patent Office.

The Truing of Abrasive Wheels.

Carborundum and emery wheels are of valuable shop service and much ingenuity has been exerted to maintain the high efficiency of a free cutting and nicely balanced wheel. The hardness of the material was best met by the use of a diamond tool, though several substitutes of more or less success have been devised. A diamond which is sufficiently strong and hard to true up the surface of an abrasive wheel is quite expensive and the nature of the tool gives but little guarantee against loss of the minute and costly crumb of carbon loosening its grip and dropping out of sight.

George E. Metcalf, of Worcester, Mass., in attempting to provide a construction which would dispense with the use of diamonds for truing emery wheels has brought to light a property of these abrasives which does not appear to have been previously known and by means of this characteristic it is practicable to dress or resurface emery wheels to various degrees of coarseness of the cutting surface. It appears from the experiments that when two emery wheels are brought into engagement with each other and have their axes substantially parallel so that the two wheels will rotate at the some peripheral



ABRASIVE WHEEL IMPROVEMENT.

speed, not only will a smaller wheel act to true up a larger wheel but the emery particles upon the engaging surfaces interlock with each other so that the wheel which is being dressed off will have a comparatively coarse grinding surface. On the other hand if the axis of the smaller wheel is inclined at a considerable angle to the axis of the larger wheel the former will be driven at a much slower speed than in the other instance. In practice it appears that when a small wheel is employed in this manner the action of the truing wheel will closely approximate the results produced in turning down an emery wheel with a diamond—that is to say, it will produce a comparatively fine or smooth grinding surface.

Figs. 1, 2 and 3 show the device on which a patent has lately been granted and Fig. 4 is from a photograph of the contrivance in actual use. Fig. 1 is a side view, partly in section. Fig. 2 is a diagrammatic view illustrating the manner in which the device is employed when a comparatively rough grinding surface is desired, and Fig. 3 is a similar view to Fig. 2 showing the manner in which the construction is used when a fine or relatively smooth surface is wanted.

A small carborundum wheel A is mounted on a split bushing B having chamfered ends. The wheel and bushing are mounted on a spindle which has a steadying ball or weight C. A second steadying ball D is threaded on to the other end of the spindle and both C and D have cones for engaging the ends of the bushing B. The tightness of the bearing may be regulated by adjusting the position of the ball D on the shaft and locking it in place by the check nut shown. The inside of the bushing is chambered and holds a supply of lamp wicking or felt which is soaked with oil and the device is thus rendered self-oiling for several weeks. The wheel E is cut quickly when the spindle is inclined at an angle as in Figs. 3 and 4 and then the task may be completed by holding the spindle horizontal and moving the tool across the face of the wheel a few times to produce a sharp, free cutting surface. The bushing is closely adjusted to the cones, so that the benefit to be derived from the inertia of the heavy balls on the ends of the spindle shall be utilized to the full.

The inventor has an improvement on the supporting bushing and method of lubrication which will be made the subject of another patent. The ends of the bushing extend over the hubs of the balls so as to keep out grit, the bushing does not run on these sleeves but on cone bearings further in. A blind screw in one of the balls

FIG. 4.—ABRASIVE WHEEL IMPROVEMENT.

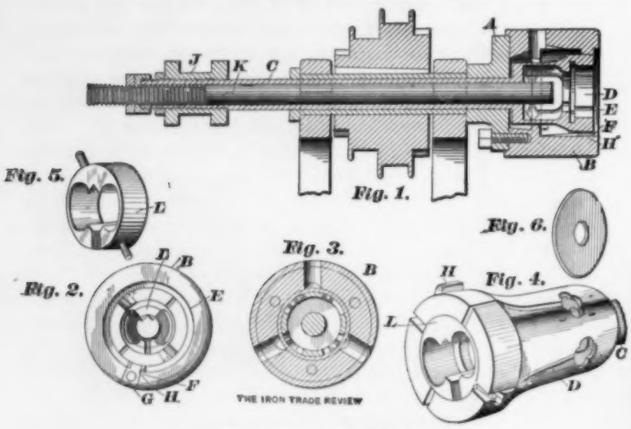
seals an oil passage which leads by way of a groove in the spindle to the chamber in the bushing.

A New Chuck.

A chuck has been patented by H. F. Neumeyer, of Macungie, Pa., which not only seems effective in speedily gripping work but when used for the reception of small articles adds an element of safety to a task which is often attended with distressing injuries. The danger arises of course from a desire to get the work into and out of the machine without stopping the spindle and in cases where the stock is fed through a hollow spindle and cut up into studs, etc., this method is quite satisfactory; but in handling separate pieces which must be individually placed in position and clamped the operation is not only dangerous but it very often happens that the article is not properly centered. This source of inaccuracy is particularly evident in the case of irregular shapes. Devices have been made for the feeding of separate pieces into screw machines by suitable magazines, the feed being purely automatic; but the inventor in the present instance does not aim at this and supplies means by which the chuck may be opened and closed, stopped and started, without arresting the movements of the machine as a whole. He has, in fact, designed the machine to meet the requirements of his business which handles many parts of small valves, cocks, brass fittings, etc., and he therefore has ar-

ranged the master collet to receive different collets which can be rapidly changed to meet the varying character of the work without the necessity of stopping the entire machine. There is also an adjustable stop employed with the chuck which limits the distance to which the articles may be inserted.

A vertical sectional view through the mechanism is shown in Fig. 1, and Fig. 2 is an end elevation of the head



NEUMEYER QUICK-ACTING CHUCK.

and collet. Fig. 3 is a sectional view taken through chuck in Fig. 1. Fig. 4 is a prespective view of the master collet and Fig. 5 is a perspective view of one of the auxiliary collets. Fig 6 is a view of the steel disc sometimes employed as a stop. Figs. 7, 8 and 9 are from photographs showing the machine with collet closed and open and some samples of the work on which the chuck has been employed to advantage.

The invention is illustrated as applied to an ordinary lathe with hollow spindle. The latter has a face plate

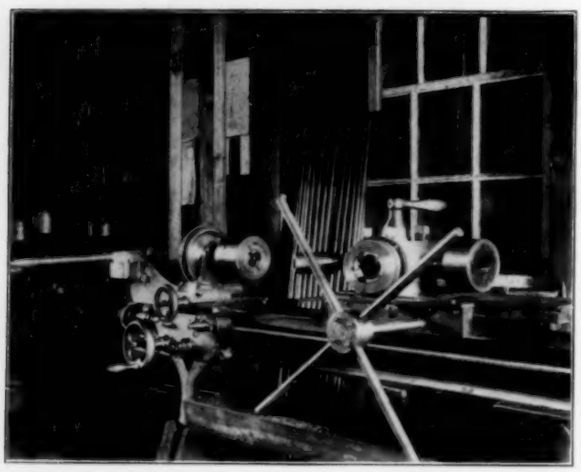


FIG. 7.—NEUMEYER COLLET DRAWN IN AND ROTATING WITH CHUCK BODY.

A to which is attached a head B by means of screw bolts, the head being hollow for the reception of the chuck. The hollow spindle has a sliding stem C, the spindle, however, turning independently of the stem. A master collet D is secured at one end of the stem C and has a number of spring jaws. These jaws are tapered at the outer end to engage with a bearing flange located just within the mouth of the head, and further back on the jaws of the master collet is a cylindrical surface which acts as a guide when the jaws are moved endwise. The edge of the head B is rabbetted as at E and a keyway F extends from the rabbet into the chamber. A stop-plate G is secured to the outer end of the body and extends across the rabbet E at one side of the keyway F as clearly shown in Fig. 4. One of the collet jaws carries a key H which slides in E and passes into the keyway F when the stem C is moved endwise.

One of the auxiliary collets is shown in Fig. 5, and in the other views as L, is in the form of a split ring of tool steel. The inside of the ring is formed to fit the piece of work it is intended to hold in the chuck and the outside of Fig. 5 is shaped to fit the interior of the master collet. The inward movement of Fig. 5 is limited by a stop flange located within the master collet. The ring, Fig. 5, has lugs or pins on opposite sides which engage with bayonet slots to maintain it in place.

A suitable hand lever has one end forked to fit the groove J formed between the flanges of a collar secured upon the rear end of the stem C. A brake in the form of a finger is arranged in the path of this collar, and is held and adjusted by a setscrew. It is evident that when the lever is swung in one direction the stem C will slide through the lathe spindle and the outer end of the collect will be projected from the outer end of the head, allowing the spring jaws of the collet to open. This movement will disengage the key H from the keyway F

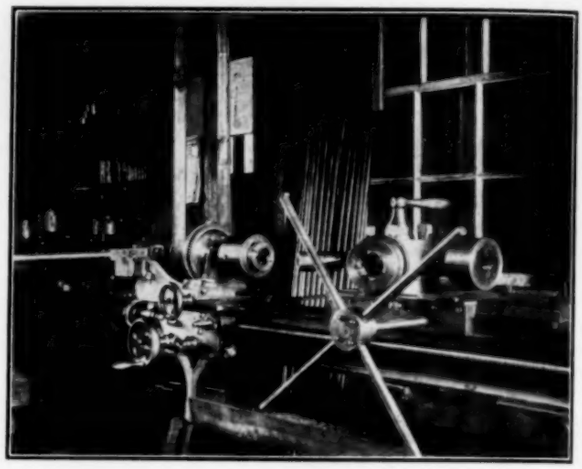


FIG. 8.—NEUMEYER COLLET OPEN AND AT REST, CHUCK ROTATING.

and also bring the collar in contact with the brake finger and thus the stem and collet are held against rotation. On the other hand, when the hand lever is moved in an opposite direction the collet is withdrawn into the head and this not only moves the jaws together but at the same time frictionally engages them with the head and interlocks the key. The stem is by the same motion released from the brake.

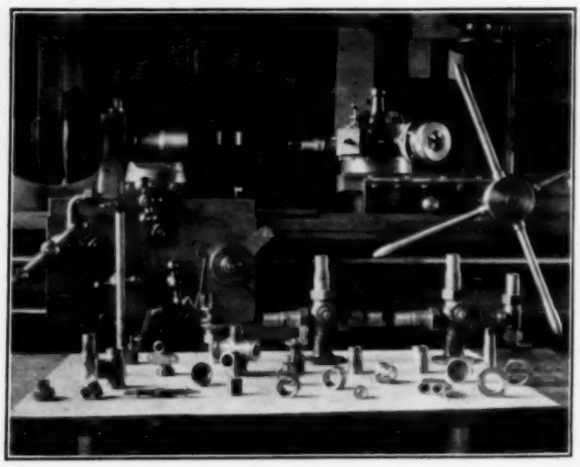


FIG. 9.—SAMPLES OF WORK HANDLED IN 4-INCH NEUMEYER CHUCK.

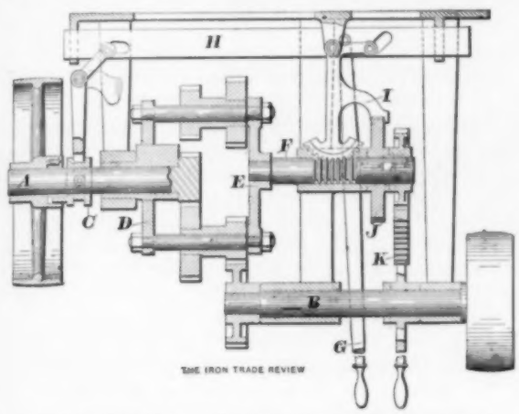
The rod K is employed for limiting the distance to which articles may be inserted in the collet. The rear end of the rod is threaded and provided with check nuts for adjustment. When machining short pieces, the steel disc, Fig. 6, may be used instead of the rod K, the disc being placed in back of the auxiliary collet L and resting against the flange.

The rod K may be removed when tubes or rods are

to be machined, thus leaving a passage through which the stock may be passed and cut in the ordinary manner. A number of openings and channels are formed in the head and collets through which the chips may emerge and the chuck be thus kept free of anything which would interfere with the proper operation of the parts.

A Variable Speed Mechanism.

A variable speed device which is for convenience of illustration shown applied to a countershaft has been designed by Anton Mill, of Cincinnati, for machine tool requirements. The inventor has aimed at the production of a simple and compact mechanism which should have very few gear wheels and at the same time have the



POSITIVE SPEED-CHANGING DEVICE AND COUNTERSHAFT.

shifting devices so connected with the prime moving wheel that the changes can be quickly made with the power removed.

The illustration shows a vertical section through the device. A number of brackets are suspended from the ceiling and support the driving shaft A and the driven shaft B. There is a driving pulley loose on the shaft and C is a clutch for fastening or releasing the pulley to and from the driving shaft A. A clutch operating lever is pivoted to one of the brackets and one end engages into a slot in the sliding bar H. Gears are secured to the ends of the driving and the driven shafts and these turn in parallel planes, the primary object of the invention being to bring a graduated series of compound intermediate gears into mesh with the driving and driven gears. Thus the speed is always obtained from the same driving and driven gears but compounded by the intermediates. The support for these intermediate gears consists of two opposing discs D and E, the former being journaled on a sleeve on the shaft A and the latter having a stub shaft F in a long bearing which is concentric with the journal of the disc D so that these discs can rotate as a unit. The stub shaft F is provided with a rack which is reached through a slot in the journal bearing. The stub shaft F has also a notched disc M and a gear wheel. Between the discs D and E are four studs on which turn compound gears. Four changes are shown but the range could be increased or reduced as might be desirable.

The intermediate gears have an orbit of revolution around the shaft A and at a given point each of the intermediates is thrown into mesh with the driving and driven gears and at other points the intermediates are out of gear and hence stationary. The stub shaft F is movable endwise in the bearings and the disc D is also capable of sliding along the journal so that in this way the support may be slid to a position at the right of that shown by the engraving and then the discs can be rotated without bringing any of the intermediates into train. Any of the compound gears can be brought into position before bringing the gears into mesh with the driving and driven gears.

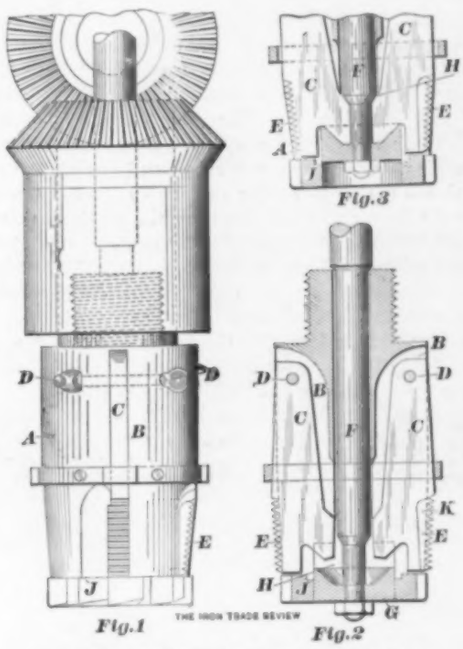
A bell crank lever has a toothed segment which engages the teeth in the rack on the shaft F through the slotted bearing. The bell crank has a locking pawl I which engages notches in the disc J. The outer end of the bell crank has a pin which engages in an inclined slot in the sliding bar H. A rocking lever is fulcrumed on the shaft B and has a toothed segment K in mesh with a gear on the stub shaft F. This rocking lever has an index quadrant opposite the handle for indicating the different positions of the several intermediate gears. A lever G is pivoted to the supporting structure and actuates the sliding bar H.

Take the lever in vertical position as in the illustration with the pawl I engaging one of the notches in the disc J. The handle G is grasped and the gear support shifted to the right, this movement releasing the pawl I from the disc J; the outer end of the lever rises in the slot in the bar H and the clutch C is disengaged. The gear support can then be rotated by means of the rocking lever, the segment K and the gear wheel, until the selected intermediate is rotated to the point opposite to the meshing position. Then the lever G is moved in the other direction, the slot in the sliding bar H permitting a certain degree of sliding to the return position without fixing the clutch. A slight movement of the rocking lever rolls the intermediate into mesh with the driving and driven gears, the final motion of the lever G is then completed and slides the intermediate gears into full mesh, locks the pawl I into the appropriate notch in the locking disc J and clutches the power wheel to the driving disc. These operations are performed simultaneously.

The inventor shows certain modifications of the same device but the general scheme is fairly outlined by the above description.

A Collapsing Tap.

The patent papers call the device invented by F. J. Nutting, of Dayton, O., a tap, but there are other features in combination as will be seen on examination of Figs. 1, 2



COMBINATION REAMER AND COLLAPSING TAP.

and 3. Fig. 1 is a vertical elevation of a collapsible tap with the jaws contracted. Fig. 2 is a sectional elevation with the tap jaws expanded and Fig. 3 is a sectional elevation with the tap jaws contracted as illustrated in Fig. 1.

There is a head A which has four longitudinal grooves B on opposite sides for the reception of the tap jaws C, these jaws being pivoted at D. The tap jaws are adapted to expand and contract as may be required by means of the rod F and the cupped cone G. The extreme end of the rod F is reduced in diameter and there is a tapering or cam surface H. In the outward or expanding movement of the rod F the tapering surface H comes in con-

tact with similarly shaped surfaces on the tap jaws and thence in contact with the straight surfaces of the jaws which ride on the surface of the larger diameter of the rod F and thereby expand the tap jaws to their outer position as shown in Fig. 2.

The collapsing or contracting cone G is made fast upon the smaller portion of the rod F by means of a nut, and the interior tapering surface of the cone G in the inward or upward movement of F contracts the tap jaws C to the position illustrated in Fig. 3.

There is a retaining band which surrounds the head A and is fastened by means of countersunk screws. This band is designed to prevent the tap jaws C from moving out of the openings B to an unnecessary extent.

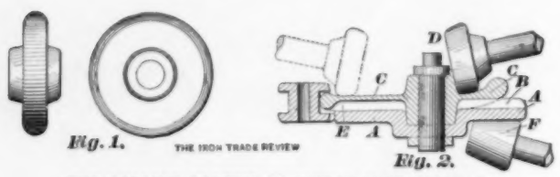
The head A has at the lower end a reamer J which cuts the opening to size in advance of the tap so that the hole is reamed and tapped at the one operation. The head A has a series of recesses for the reception of the chips during the tapping.

In operation the tap is adjusted by moving out the rod F to the position shown in Fig. 2 which spreads the tap jaws C to their outer position. The material to be cut is then brought into contact with the reamer J which cuts the opening for the tap. The tap jaws then cut the threads, the rod F is moved endwise to bring the cone G against the contracting surfaces of the jaws and the largest part of the rod F away from the tap jaws when the tool can be ready removed from the finished hole.

Wheel Manufacturing.

The use of the press in manufacturing methods is much in vogue as a convenient factory process in duplicate work. The press, however, is so largely adapted in sheet metal work that the use of the same scheme for heavy purposes does not seem at first glance so attractive. An ingenious German engineer, Heinrich Ehrhardt, of Dusseldorf, has devoted much attention to this branch of engineering with remarkable success. It is asserted that since the establishment of his plant in 1889 it has grown to an extent which calls for the services of 6,000 workmen. The Ehrhardt method of making seamless tubes was described in *The Iron Trade Review* last year. These tubes, by the way, are said to be made up to 16 feet diameter for boiler service, and during the recent discussion on the Mercader system of axle manufacture before the Iron and Steel Institute the work of this plant was mentioned appreciatively. A recent patent taken out on these advanced lines in this country will therefore be of interest as showing the point to which the press and rolling manipulation of steel may be carried.

The invention relates to the manufacture of a wheel



THE ROLLING PROCESS IN WHEEL MANUFACTURE.

combining both spoke and disc advantages. Fig. 1 is a side elevation and plan of one form of blank for the wheel and Fig. 2 is a cross section of a wheel undergoing the rolling operation in the process of manufacture.

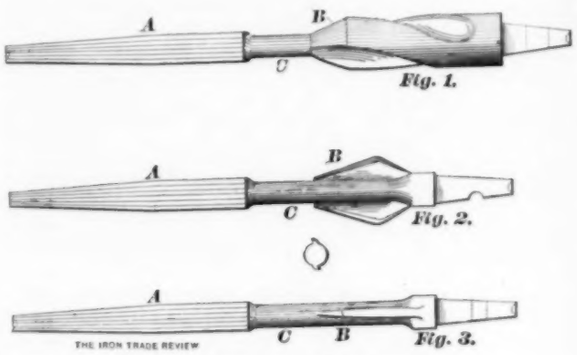
The blank may be either a plain disc having a nave but no ribs as in Fig. 1 or a disc with radial ribs. Such a blank is laid upon a disc shaped die A as in Fig. 2, the die having radial grooves B for forming the spokes E. The blank is rolled into this die, the pressure beginning at the nave and being gradually carried to the circumference. The blank is in this way rolled into the grooves and a disc C formed above them. The die A having a smaller diameter than the finished wheel there is formed by this method of pushing the material from nave to circumference a swelling of the rim with a pear-shaped section which protrudes over the edge of the die A. The rolling is effected between the roller D and the die A, and either or both A and D may be driven, the roller F taking the pressure of the roller A. The roller A starts at the nave as shown and works towards the circumference as seen by the dotted lines at the left of Fig. 2.

The system of rolling shown on the left of Fig. 2 can also be employed when the disc wheel has been formed by hammering or pressing by means of a top die in steps from hub to periphery. In this case the roller A is only intended for the formation of the swelling at the rim.

Cutting and Countersinking Tool.

The inventor, Allen E. J. Luckhurst, of Philadelphia, has received a patent on the tools shown. They have been designed more particularly for use with pneumatic drills where there is not otherwise a ready means of keeping the countersinking in line with the previous reaming and the inventor proposes therefore to combine the reamer and the countersinking part with a connecting neck of considerable length. The neck being slightly smaller than the largest diameter of the reamer and the smaller end of the countersinking tool so as to act as a guide for the latter.

This is very simply arranged and the character of the device would not impress one as of a patentable type but this is evidently an error. Fig. 1 is a view of a combined reaming and countersinking tool and Figs. 2 and



COMBINATION TOOL FOR PNEUMATIC DRILL.

3 are elevations of modified forms embodying the invention. Fig. 4 is a cross section of Fig. 2 on the line x x. A is the reaming portion, B the countersinking part and C the connecting neck.

The inventor says "The function of the neck C is to provide a guide for the countersinking tool and a clearance space to enable the borings of the countersinking part B to freely escape. In other words, the neck facilitates the entrance and working of the countersinking tool after the reamer has passed through the hole and guides it, and so long as it performs these functions it may be modified without detracting from the efficiency of the combination.

So far as the general scheme goes of an entering reamer followed by another tool, the tap elsewhere described in this article is worth noting.

Portable Device for Centering Shafting.

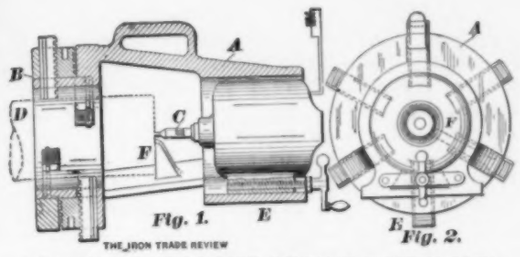
This invention has been patented by Frank H. Hudson, of Lynn, Mass., and refers to a portable device for clamping on the end of shafting and drilling a center hole. Figs. 1 and 2 showing a section and end elevation of the machine.

The centering device comprises a holder which as a whole is indicated by A. There is a chuck B at one end of the holder and at the other end of A is a rotary drill C which is in alignment with the length of shafting D held by the chuck. The chuck B is adapted to bear on and grasp the work D at a sufficient number of points to engage the holder A firmly.

A motor is applied so that the rotary armature is in contact with the drill and the motor casing is provided with a dovetail slide E moving in a guide formed in the holder A. The slide E has an opening threaded for a feed-screw journaled in a bearing fixed to the holder A. This screw projects or retracts the motor and drill. The

motor is contained in a guide at one end of the holder A and the chuck is at the other end, the guide and chuck being separated from each other so that the drill and the end of the shaft are exposed to view.

The extent to which the work enters the holder may be determined by a stop F as shown in Fig. 1. This stop



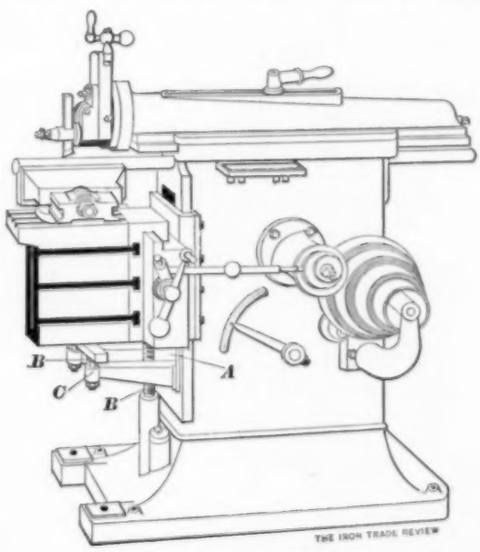
CENTERING SHAFTING WITH PORTABLE ELECTRIC DRILL.

is located between the chuck and the motor guide and prevents injurious contact between the drill and the end of the shaft when the device is being first placed in position.

Table Support for Shapers.

This device has been patented by Smith G. Chambliss, of Xenia, O., and is a means of supporting the shaper table in a level position and an arrangement for raising and lowering the same. The illustration shows a perspective view of a shaper with the contrivance in place. The table carriage on the front of the column has slide plates A and to the lower ends of these are attached the bracket arms B. These project forward to about the center of the table. The slide plates A are integral with the carriage and have their inner faces planed flush with the side of the carriage and slide upon the vertical ways to which therefore the strains are imparted. There are hubs C on the front ends of the bracket arms and a threaded rod passes through a bore in each hub, nuts being placed on the rods at the ends of the hubs.

A cross rail is in threaded engagement with the screws passing through the hubs C of the bracket arms B and on this the table rests. The screws and nuts being used to adjust the cross rail under the table. These table supports are raised and lowered with the table and when the



STEADYING THE SHAPER TABLE.

adjustment is once obtained it is not disturbed by the movement of the table either vertically or laterally.

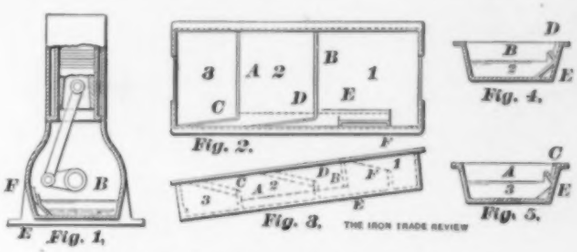
System of Splash Lubrication.

The inventor, Alanson P. Brush, of Detroit, Mich., has patented a system of splash lubrication for multiple cylinder engines. The object being to permit an engine of this type to be set at an angle from the horizontal without any cylinder of the engine having an excess or lack of oil and with but a single oil feed for all the cylinders.

The illustrations show an oil pan for a triple cylinder engine. Fig. 1 is a view in vertical cross section looking to the left of the plan seen in Fig. 2. Fig. 3 is a side elevation showing the interior of the oil pan in dotted lines, one end being higher than the other. Fig. 4 is a vertical cross section through pit 2, Fig. 2, looking to the right. Fig. 5 is a similar section in pit 3, Fig. 2, looking to the right.

The oil pan has a separate pit for each crank of the engine, these pits being indicated by the numbers 1, 2 and 3 and separated by walls A and B running across the pan. Each pit has a trough on the side toward which the crank moves when at the lowest position.

Beginning at one end of the oil pan as with the pit 3, this pit has a trough C leading along the side of the pan and discharging at the lower end over the partition A into the pit 2. The pit 2 is similarly provided with an angular channel D on the side of the pan, discharging in the same manner over the wall B into pit 1. The pit 1 has a long opening and conduit E which is closed at the end in pit 1 and leads back and discharges into pit 3. It is evident that by placing the trough and conduit on the side to which the cranks move when in their lowest position the greater part of the oil will be thrown against the side of the frame directly over the troughs and the opening into the conduit. The greater part of the oil thrown from pit 3 by the crank is caught by the trough and goes over into pit 2 and the oil thrown by the crank



AN IMPROVEMENT IN CRANK CASE LUBRICATION.

arm in pit 2 is caught by the trough and carried into pit 1 where the same operation forces the oil into E and back to pit 3.

The scheme may be of course applied to any number of cranks and the supply of oil may be introduced into any one of the pits, the action of the cranks equalizing the supply for each cylinder.

Edwin C. Potter has been appointed receiver of the U. S. Locomotive Corporation, having a plant at Hammond, Ind. This company was the successor of the old firm of Torbert & Peckham. The assets are estimated at $300,000, consisting largely of real estate. Liabilities have not been officially announced, but they are said to be far in excess of the assets. The company was organized last March with a capital of $300,000. The concern which it had succeeded had been engaged in buying and rebuilding old locomotives for a number of years.

The Ramapo Iron Works, of Hilburn, N. Y., and the MacPherson Switch & Frog Co., of Niagara Falls, N. Y., have been consolidated with a capital of $1,400,000. The principal plant will be in Ramapo; the directors are: W. M. Snow, F. W. Snow and R. J. Davidson, of Hilburn; W. B. Rankline, of Niagara Falls, and J. M. Van Winkle, of Bloomfield.

The Wing-Sale Foundry & Machine Co., Little Rock, Ark., has been placed in the hands of Thos. Cox as receiver. Assets of the company are about $10,000 and the liabilities about $11,000.

Robert A. Inch was appointed receiver of the Enterprise Gas Stove Mfg. Co., of New York City. Liabilities are $15,000 and the stoves on hand are worth $8,000.

A Graphical Daily Balance in Manufacture.*

BY H. L. GANTT, SCHENECTADY, N. Y.

At the December meeting in 1902 the writer presented a paper entitled "A Bonus System of Rewarding Labor," in which was given an account of the results under that system at the works of the Bethlehem Steel Co., and a description of the method employed. The paper dealt particularly with the method of setting a task and with the reward for its accomplishment. It consisted briefly in setting as a task for a day's work the amount that a good man could reasonably be expected to accomplish, and paying the man a substantial amount in addition to his day's wages if the whole amount was done. If less than that amount was done he simply got his day's wages. The result of this system, when the task was set in an intelligent manner and accompanied by a suitable compensation, was an efficiency of operation so far beyond that obtained by the ordinary day or piece-work method that it attracted a great deal of attention.

This centering of the attention on the result had, however, a serious disadvantage, for it withdrew the attention from the most important parts of the paper—namely, that describing the method of setting the task, and that referring to the method of operating the system by which an exact record was kept. The method of setting the task is substantially that developed by Mr. Fred W. Taylor for setting piece-rates, and was described at some length. His paper before the present meeting further elucidates that part. The routine operation of the system, which involves keeping an exact daily record of the work done, was not, however, so clearly explained, and it is to that subject that this paper is devoted.

In order to operate such a system we must not only have an exact record of what each workman does every day in order to find out whether he has earned his bonus or not, but must have beforehand an exact knowledge of the work to be done and how it is to be done. This amounts to keeping two sets of balances; one, of what each workman should do and did do; the other, of the amount of work to be done and is done. The former, or man's record, is concerned with the payment of the bonus, and consists in an exact comparison of what should be done as determined by our investigations, and what has been done as shown by the daily reports.

Daily Balance of Work.—The latter is a balance of work on each order, and should show at a glance each day just what has been done and what remains to be done, in order to enable us to lay out the work for the next day in the most economical manner. The importance of such a balance has been long recognized, but the difficulty of getting it is such that it has seldom been attempted. Many concerns get a weekly or monthly balance; but in both of these cases the information is usually obtained too late to prevent delays in work. Again the value of a balance is dependent largely upon its availability; in other words, upon the ease with which the desired information can be obtained from it. With this idea in mind the writer devised a combined schedule for work and a balance sheet that is largely graphical in its nature. On it dates are represented by positions, and when work is not done on consecutive days, there are no entries in consecutive positions. This practice enables the foreman or superintendent to see at a glance what work is going along properly. Such schedules can be made out for all classes of work, and a description of one or two will amply illustrate the principle.

A Foundry Balance.—Fig. 1 represents such a balance sheet and schedule for a foundry. At the heads of the various vertical columns are the names of the pieces to be cast, under each is its pattern number; then, in order, when the pattern is due at the foundry, when it is received, the number wanted per day, and the total number wanted. Below, each column is divided into two columns headed *daily* and *total*. These are crossed by horizontal lines representing consecutive working days on each, of which is entered in the proper column the number of

FOUNDRY PRODUCTION SHEET.

A. L. CO. SCHENECTADY WORKS.

ORDER NO. 83
8 ENGINES D. L. & W.

PART.	Bell Stand.		Exhaust Pipe.		Tender Frame Center Pin.		Engine Truck Swing Bolster.		Grate Bar.		Grate Side.		Grate Side.		Ash Pan End.		Ash Pan Side.		Grate Frame Support.		Grate Bar.	
PATTERN NO.	17,212		17,939		16,927		16,907		19,458		18,953		18,954		21,343		21,341		18,959		18,961	
PATTERN DUE.	2–2		2–2		2–2		2–2		2–2		2–2		2–2		2–2		2–2		2–2		2–2	
PATTERN REC'D.	1–22		1–22		2–6		2–4		2–9		2–10		2–10		2–10		2–10		2–14		2–14	
NO. WANTED PER DAY.	1		1		1		1		8		2		2		1		1		1		1	
TOTAL NO. WANTED.	8		8		8		8		64		16		16		8		8		8			
NUMBER MOULDED.	Daily	Total	Daily	Total	Daily	Total	Daily	Total	Daily	Total	Daily	Total	Daily	Total	Daily	Total	Daily	Total	Daily	Total	Daily	Total
Feb '03 2			1	1																		
3			2	3																		
4			2	5			1	1														
5			*1*																			
6			1	5																		
7																						
9			2	7	2	2	1	2	P													
10							1	3	3	3	1	P 1	1	P 1		P		P				
11	4	4					1	4	*1* 8	10	2	3	2	3	1	1						
12	*1* 2	5	1	8	2	4	1	5	7 2	5	1	4	1	4	2	3						
13					3	7	1	6			2	6	2	6	*1*	2	3	3				
14	1	6					1	7	8	13	1	7	1	7						P		P
16	2	8			1	8	1	8	*1* 5	17	1	8	1	8	2	4	1	4	3	3	2	2
17									*1* 8	24	1	9	1	9	2	6			4	7	2	4
18									2 8	30	1	10	1	10	2	8	2	6	1	8	*1* 2	5
19									*1* 8	37	2	12	2	12			2	8			*1* 1	5
20									8	45	2	14	2	14								
21									8	53	2	16	2	16								
23									*1* 7	59											1	6
24									5	64											1	7
25																					1	8
26																						

Begin moulding not later than date opposite *upper heavy* line.
" " " " " *lower* "
Finish " " " " "

THIS IS A PORTION OF AN ORDER SHOWING HOW THE RECORDS WERE ACTUALLY KEPT. THE FIGURES IN ITALICS REPRESENT CONDEMNATIONS. THEY ARE USUALLY ENTERED IN RED INK.

FIG. I.

*Read at the Saratoga meeting (June, 1903) of the American Society of Mechanical Engineers.

pieces made that day and the total number made to that date. Each column is crossed by two heavy horizontal lines, the upper one opposite the date at which the work should be begun, and the lower one opposite the date at which the work should be completed. These lines are usually red, and have been very appropriately named *danger lines*. The position of the entries with reference to these danger lines and the amounts of those entries show to what extent the schedule is being lived up to. If the schedule is being well followed the entries are always in the neighborhood of the red lines, or above them.

Fig. 1 represents a portion of an actual order showing how it was filled in the foundry of the Schenectady works. If there is no graphical check on the operations of the foundry, the work that is wanted during a certain week may be spread over three or four.

It is an extremely difficult matter for a foreman to get the work done exactly in the order it is wanted. For instance, if we are building two locomotives per day, each requiring four driving boxes, it seems an extremely difficult thing for him to get every day, without fail, at least eight driving boxes. There is a constant tendency when he is rushed with work to drop to seven or six with a corresponding decrease in output of locomotives. This tendency to give about what is wanted rather than exactly what is wanted, is the most common obstacle to getting the full output of a plant.

A L. CO. PRODUCTION SHEET

SCHENECTADY WORKS MACHINE SHOP No. 1.

ORDER No. 77
15 ENGINES N. Y. C.

PART			FRAMES									RAILS.											
PUR ORD; SKETCH; PAT. OR CARD DR. No.																							
OPERATION			REC'D		PLANED		SLOTTED		DRILLED		ASSEM'D	REC'D		PLANED		SLOTTED		RE-PL-TOP		RE-PL-BOT		DRILLED	
TO BE BEGUN																							
TO BE FINISHED																							
NUMBER WANTED			15		15		15		15		15	30		30		30		15		15		30	
NUMBER FINISHED			DAILY	TOTAL	DAILY	TOTAL	DAILY	TOTAL	DAILY	TOTAL	DAILY TOTAL	DAILY	TOTAL	DAILY	TOTAL	DAILY	TOTAL	DAILY	TOTAL	DAILY	TOTAL	DAILY	TOTAL
1903																							
JAN	20		2	2	2	2						6	6										
	21		2	4																			
	22				2	4						6	12	6	6								
	23		1	5										4	10								
	24		2	7	1	5	3	3						2	12	4	4						
	25		4	11	2	7	1	4				6	18	4	16			1	1	1	1		
	27															4	8	3	4	3	4		
	28		1	12	2	9	3	7	2	2		4	22	4	20	2	10						
	29		2	14	1	10	1	8	1	3		4	26	4	24	4	14	2	6	2	6	4	4
	30		1	15	1	11	2	10	1	4								1	7	1	7	4	8
	31				3	14	1	11	1	5		4	30	2	26	4	18	2	9	2	9		
FEB	2						1	12	1	6	2 2			2	28	4	22	1	10	1	10		
	3				1	15	1	13	3	9	1 3			2	30	6	28	3	13	3	13	2	10
	4								2	11	2 5					2	30	2	15	2	15	4	14
	5								2	13	1 6											4	18
	6						2	15			2 8											6	24
	7								2	15	1 9											4	28
	9										2 11												
	10										1 12											2	30
	11										1 13												
	12										1 14												
	13										1 15												
	14																						
	16																						
	17																						
	18																						
	19																						
	20																						
	21																						
	23																						
	24																						
	25																						
	26																						

RECORD AS ACTUALLY KEPT.

FIG. II.

A Daily Balance as a Permanent Record.—This balance sheet shows not only how much work was done each day, but is a permanent record of exactly how the order was filled, which can be compared with the record of the previous and subsequent orders. This is best illustrated by a study of Fig. 1, which shows exactly where failure to comply with the schedule occurred. The letter *P* entered in some of the columns shows graphically the reason for the castings being behind. The pattern was not received until the date indicated. Similar sheets might show that it was the draftsman and not the pattern-maker who was to blame.

A Machine Shop Balance and Routing Sheet.—Fig. 2 is a similar balance sheet for work done in a machine shop on a series of locomotive frames and rails. The order in which the various operations are to be performed has been determined, and the consecutive columns devoted to the operations in their proper order. You will note that on this sheet, which is an actual record of work, the consecutive operations were performed promptly, and that there was no serious delay.

Fig. 3 represents a record of the same work as it would appear if the works were short of frame-drilling capacity, and the drilling of frames were not done promptly. If it is impossible to make up the delay thus caused the output is limited by it. Such sheets show at a glance where the delays occur, and indicate what must have our attention in order to keep up the proper output. If the delay is always on the same operation we know that we must either get more output from the machines doing that work, or get more machines. Lines representing when work should be begun and when it should be finished are used on the machine shop sheets as well as on the foundry sheet, but have been left off to avoid confusion.

A Graphical Balance as a History.—A complete set of such sheets for all the work being done in a plant gives a complete schedule and a daily record of what is being done, and is of the greatest possible advantage if an attempt is to be made to improve the conditions or increase the output of the plant. In fact, if the improvement in the operation of a plant is to be made in a scientific manner, exact knowledge of what is taking place each day is absolutely necessary. Without it money is often spent wastefully, and but a small proportion of the desired results obtained. In large plants run without such a system of balances it is frequently impossible to tell just what is holding back the output, and then the value of such a balance is out of all proportion to the cost of obtaining it. By using the graphical form its value is very much increased, for the general appearance of the sheet is sufficient to tell how closely the schedule is being lived up to; in other words, whether the plant is being run efficiently or not. Moreover, such a balance is a history of the way the work went through the shop and is readily comparable with similar work done previously or subsequently, thus enabling us to form a definite idea as to whether the plant is being run more or

less efficiently. The balance of work sheet then gives us a daily analysis of how the work is progressing, and in its graphical form is so easily read that both foreman and superintendent find it of great value. The man's record shows the efficiency of each man, and the two taken together give us the knowledge, in the clearest way, of what should be done to increase our output.

Value of Balance not Dependent upon Method of Compensation.—It is not the intention of this paper to discuss the making of schedules for doing work, or instruction cards for the workmen to follow, or indeed the subject of compensation for work done, for the keeping of a daily balance of work done and a record of the men doing it are invaluable, no matter what the method of compensation. In fact, the writer has found the *man's record* when work was done by the day to be of the highest value, for when the men realize that not only their chance for increase of wages, but that of holding their positions depends upon the amount and quality of their work, they become very much more efficient. Add to this the fact that efficient men paid in proportion to their efficiency are invariably better satisfied than less efficient, cheaper men, and we have an added reason for keeping the man's record. Again a workman easily forgets how many days he has been absent, and how much poor work he has done, and an occasional glance at his record often does him a great deal of good. The writer first kept such a record in the foundry of the Midvale Steel Company thirteen years ago, and found it so valuable that he has always done it since when possible. Such record sheets are so easily gotten up and of so many kinds that the writer has not considered it necessary to illustrate them.

The Graphical Balance and the Foreman.—Next to the superintendent the most overworked people in the ordinary manufacturing plant are the foremen. Their duties may be summed up as follows, in the order of their importance: to get their work out on time; to get it out economically; to improve their methods. Add to their primary duties a multitude of others depending upon them, and but little time is left for thought, or investigation, on which depends improvement. When they are rushed, therefore, improvement is naturally the first thing to suffer. Further pushing causes economy to be sacrificed, for the work must get out, and the foreman has not time to go over and over his orders to see just what is the most economical arrangement of his work. Here is where the graphical schedule comes to his assitance, for he can see at a glance just what is behind or what should be done next. There has been but little difficutly in getting foremen to recognize the value of such a balance, and I have yet to learn of one, who, having gotten such a sheet in full operation, was willing to give it up.

Cost of Keeping Balances.—The question is frequently asked as to the cost of keeping these records and balances. In reply I have to say that if such cost were ten times what it is, it would cut no figure. In day work we buy a man's time, and he frequently gives but little else. Our store-keeper checks exactly the materials we buy, but nobody knows exactly what the day workman has done in his ten hours; although we know labor to be the most difficult commodity we have to buy, we give it the last systematic study, and my effort to get an exact record of what we get for our money is the first step toward purchasing it in an intelligent manner. With regard to the balance of work, I can only say that it is hard to estimate the cost of lack of harmony in a plant, and the increase in efficiency produced by getting materials in their proper order rather than according to the judgment of the various foremen is greater than is usually realized.

The fact that, as far as the writer's experience goes, the foremen are not only willing to use these graphical sheets, but are glad to do so in order to make their work harmonize with that of other departments, is the strongest proof of the value of the graphical over the other forms of balance.

The value of a balance of some sort is too well understood to need discussion, and the only reason that it has not been adopted is often the fancied cost of getting it. As a matter of fact, all I have suggested can usually be gotten by the ordinary time and cost keeping force with but little help, and frequently without any. It is so closely allied to the time and cost keeping that when all are done together by the best modern method, the reduction of labor in getting the time and cost often more than offsets the increase due to keeping the men's records and the balance of work. The method referred to is the *time and production card* system, of which the following is a description. There are conditions under which the

A. L. CO. PRODUCTION SHEET. ORDER No. 77
SCHENECTADY WORKS, MACHINE SHOP NO. 1. 15 ENGINES N. Y. C.

PART		FRAMES.										RAILS.											
PUR ORD; SKETCH; PAT. OR CARD DR. NO.																							
OPERATION		REC'D		PLANED		SLOTTED		DRILLED		ASSEM'D		REC'D		PLANED		SLOTTED		RE-PL-TOP		RE-PL-BOT		DRILLED	
TO BE BEGUN																							
TO BE FINISHED																							
NUMBER WANTED		15		15		15		15		15		30		30		30		15		15		30	
NUMBER FINISHED		DAILY	TOTAL	DAILY	TOTAL	DAILY	TOTAL	DAILY	TOTAL	DAILY	TOTAL	DAILY	TOTAL	DAILY	TOTAL	DAILY	TOTAL	DAILY	TOTAL	DAILY	TOTAL	DAILY	TOTAL
1903 JAN	20	2	2	2	2							6	6										
	21	2	4																				
	22			2	4							6	12	6	6								
	23	1	5											4	10								
	24	2	7	1	5	3	3							2	12	4	4						
	25	4	11	2	7	1	4					6	18	4	16			1	1	1	1		
	27	1	12													4	8	3	4	3	4		
	28	2	14	2	9	3	7					4	22	4	20	2	10						
	29	1	15	1	10	1	8					4	26	4	24	4	14	2	6	2	6	4	4
	30			1	11	2	10											1	7	1	7	4	8
	31			3	14	1	11					4	30	2	26	4	18	2	9	2	9		
FEB	2					1	12							2	28	4	22	1	10	1	10		
	3			1	15	1	13							2	30	6	28	3	13	3	13	2	10
	4															2	30	2	15	2	15	4	14
	5					2	15															4	18
	6																					6	24
	7																					4	28
	9																						
	10																					2	30
	11							2	2														
	12							1	3														
	13							1	4	1	1												
	14							1	5	1	2												
	16							1	6	1	3												
	17							2	8	1	4												
	18							1	9	1	5												
	19							1	10	2	7												
	20							2	12	1	8												
	21							1	13	1	9												
	23							2	15	1	10												
	24									2	12												
	25									1	13												
	26									2	15												

THIS TABLE SHOWS THE WAY FIG. II. WOULD LOOK IF THE WORKS WERE SHORT OF FRAME DRILLING CAPACITY.

FIG. III.

system to be described here may be modified; in fact, it is not always found possible to introduce it exactly as described, which, however, is the ideal method of operating it and should be approximated as nearly as possible. It was first introduced substantially in this form by Mr. Fred W. Taylor at the works of the Bethlehem Steel Co.

Time and Production Card System.—In its best development, a card is assigned the day previous to every man who is expected in at 7 a. m. the next day. Each of these cards is stamped with a rubber stamp 7 a. m. and the date. These cards are placed in a rack, which has a properly numbered space for each man, who takes it from his own card and no other. Any men coming in after 7 a. m. are not allowed access to the rack, but must get their cards from the office, where the cards are marked properly by a time stamp with the exact time each man comes in.

Without any delay each man goes directly to the work that has been assigned to him, and while his machine is running, fills in on the card his name, his number, the order number, the machine number and the kind of work he is doing. At the end of the day he enters on his card the number of pieces that have been correctly finished, and the card is signed by the foreman or inspector, certifying that all of the entries are correct. If there have

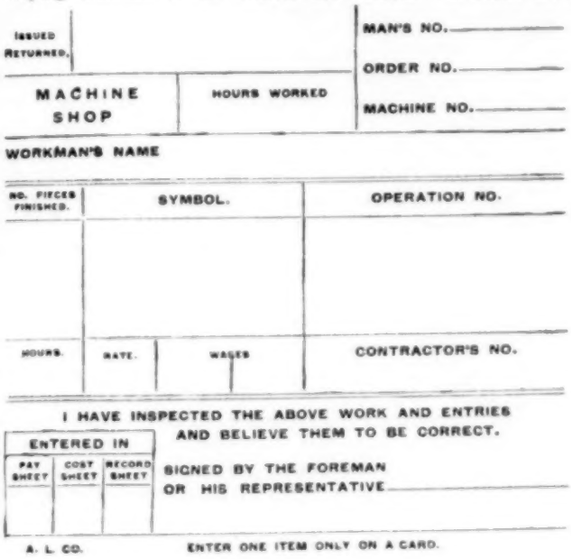


FIG. 4.—DAY WORK CARD.

been errors in the work the foreman or inspector does not sign the time card, but makes out a supplementary card stating the exact nature of the errors, etc., and pins this card to the time card.

Fig. 4 represents a suitable form of *day work* card for use in some of the machine shops of the American Locomotive Co. in connection with this system. At the end of the day, or at noon the men are allowed access to the card racks as soon as the whistle has blown, and each man deposits his card in the proper pocket, an observer noting that a man deposits one card only. Men coming in after noon get their cards in the same manner as in the morning; the cards being previously stamped with the hour work begins, and placed in the rack. Men who do not go out at noon do not need to change their cards. When the men have gone out at the end of the day or at noon, the cards in the rack are stamped by means of a rubber stamp with the time the work ends. The preferable form of card is a square one on paper stout enough to be shuffled. In the upper right-hand corner of the card should be placed the man's number, the order number and the machine number. As there is room for one order number and one machine number only on one card, the workman must give in his card at the office and get a new one whenever he goes either on a new order or another machine.

Time and Man's Record.—In order to get a record of the man's time and work for the day, all the cards bearing his number must be gotten together. If these do not give a total of the full number of working hours, the first card of the day must show that he was late, for there must be a pass stating what time he went out. These passes should be of the same size as the cards, and be put in with the time cards and sorted out by the man's number, so that when the clerk begins to enter the time and record he will have all the information at hand. The men's record may serve as a pay sheet, thus involving only one set of entries. When the time is entered up, the clerk doing it enters his initial in the lower left-hand corner in the space marked "pay sheet."

Cost.—To get the cost on an order the cards are then sorted by "order number," and when the clerk begins to enter up the time or wages against any order, he should have before him all the cards representing work on that order. He is thus enabled to make the final entry directly from the cards, thus doing the work with a minimum of clerical labor. The clerk enters his initial in the space designated for such entry on "cost sheet."

Progress or Production.—To get a record of the work on any order, the cards which have been sorted by order number are further sorted by name of part and operation. We thus get together the cards showing on an order the number of pieces on which a certain operation has been finished that day. These are added up and entered directly on the *Production or Progress* sheet. By this method we can keep an intelligible record of all the work done with a minimum of clerical labor.

Difficulty of Getting a Daily Balance.—It is not necessary for the purpose I have in mind to dwell further on the details, my object being only to show that the difficulty of getting this daily record of our men and a balance of work done is not so great as to be prohibitory. In other words, it is an entirely feasible thing to know exactly all that has been done in a large plant one day before noon of the next, and to get a complete balance of work in order to lay out that afternoon in a logical manner the work for the next dty.

Value of Such a Balance.—The value of such a balance consists in the fact that it makes clear details that no observer, however keen he may be, can see by inspection. It shows us what work is behind and how much, and enables us to trace to its source the cause of any delay. The superintendent sees at a glance what he never could find out by observation or by asking questions. It shows him how efficiently a plant is being run and where the defects in operation are. In connection with the man's record, it is the most complete analysis we can make of the working of a plant, and the one that will help us most quickly to bring into their proper channels things that have been going haphazard. Such an analysis is far more important than an improved tool steel or a new set of piece-rates. It should be established before the introduction of either of these in order that we may have some means of measuring the gain made by their introduction, and it should remain after they are introduced to show that a forward step once taken is never retraced.

In conclusion the writer wishes to say that it is his opinion that we can do nothing in a manufacturing plant that will go so far toward increasing the output or the economy of operation as obtaining this exact knowledge of what is being done. The cost of getting it is almost nothing, and the methods of operation need not be disturbed in the least until an accumulation of knowledge points out the best course to pursue. By the adoption of the methods outlined the accounting department ceases to be simply a critic of the manufacturing, and becomes an active assistant to every foreman and to the superintendent. In other words, the accounts cease to be simply records of production, and become potent factors in helping the producing departments.

The Big Stone Gap Iron Co., E. L. Harper, president, has sent out the following notice: As our entire assets and property have been taken over by the Union Iron & Steel Co., who assume all contracts and liabilities, please on July 1 change our account to Union Iron & Steel Co., Big Stone Gap Division, principal office, 71 Broadway, New York."

Saratoga Meeting of the American Society of Mechanical Engineers.

The 47th convention of the American Society of Mechanical Engineers, which was in session at Saratoga from the 23d to the 27th of June, may easily be classed with the most pleasurable of its predecessors. The program of excursions to neighboring points of interest was a long one and the local committee was prepared and in the mood to carry out the arrangements most successfully. The attendance was large, the number registered during the week at headquarters being well over 600. At the time of opening the preliminary session on Tuesday evening, over 300 members and guests had registered. The chairman of the local committee, A. L. Rohrer, electrical superintendent of the General Electric Co., welcomed the society and spoke of the extensive field represented by the committee in New York and Massachusetts.

President Dodge in reply expressed his belief that the session would be one of great interest. Some of the papers, he said, were especially noteworthy, particularly those on the question of shop management. Within the year an evidence of kindliness had been manifested by the magnificent gift of Mr. Carnegie to the engineering profession, a matter which would be taken up officially at the meeting. Membership in engineering societies is growing rapidly and the present year should show a larger increase than ever before. This remarkable increase would give an impetus to the profession that was beyond estimate. Prof. Hutton had informed the speaker that in going over the plans for the Union Engineering Building and appreciating what it is proposed to do there, it would be necessary to look fifty years into the future. He was of the opinion, under the circumstances, that anyone who could look ten years into the future and foretell what the growth would be of the engineering societies of the United States would be doing well, indeed.

The paper on the United States army gun factory at Watervliet Arsenal was the first one read by the secretary and was followed by a paper descriptive of a test made by the author, Reginald P. Bolton, on a hydraulic elevator system for passenger service installed in the department store of R. H. Macy & Co. of New York. Some criticism was offered to the effect that the ideal conditions under which the test was made could not be expected in practice and might therefore be held as liable to misunderstanding. This comment was met with the explanation that guaranteed results are determined by tests which it is customary to make under the best conditions. J. Balch Blood then presented a paper on a "Rational Train Resistance Formula," which was discussed by H. Wade Hibbard. After a reply by the author the meeting adjourned.

Mr. Carnegie's Building Offer.

At the morning session on Wednesday changes had been made in the seating arrangements, but other conditions were not so easily improved, the proximity of the convention hall to the railroad tracks causing many of the remarks made to go unheard by the majority of those present. After the presentation of the tellers' report on new members, the following resolutions were presented by Fred J. Miller, seconded by Gus Henning and adopted by a unanimous rising vote:

Resolved, That this society desires to place on record its appreciation of the purpose of Mr. Carnegie in seeking to advance by this means the interests of the profession of engineering;

Resolved, That by embodying this purpose in the form of a great and noble building for the uses of these organizations, whose aims are to foster the development of engineering, the donor has taken a step which will notably advance those interests;

Resolved, That the society approves the prompt response of the council to the opportunity offered to favor and further the interests of the society which are involved in that progress of the profession which lies at the base of the Carnegie gift;

Resolved, That it be referred to the council with power to transmit by cablegram and letter to Mr. Carnegie the action of the society and to carry out by further action the details necessary to realize Mr. Carnegie's generous purpose.

The result of the letter ballot to ascertain the sentiment of the organization on the metric system was then presented in the form of a table which is reproduced:

OPINIONS ON COMPULSORY LEGISLATION AND ADOPTION OF THE METRIC SYSTEM.

OPINION	Total Vote	Percentage	Foreign	Draftsmen	R. R. Men	Teachers	Mechanical and Consulting	Juniors	Business Men and Miscellaneous
Favor Metric System as legal standard	103	20	0	6	2	12	28	20	35
Against Metric System as legal standard	363	80	3	9	14	27	86	50	174
Favor U. S. bill	95	20	0	5	0	15	25	20	30
Against U. S. bill	342	80	1	9	14	27	82	46	163
Favor of legislation	153	33	0	8	4	20	52	26	41
Against legislation	311	68	0	9	12	21	66	46	159
Detrimental to business	243	58	1	8	9	7	56	36	126
Not detrimental to business	145	42	1	4	4	14	47	28	47
Advantageous	89	.....	1	4	0	15	28	16	25

It was suggested that lines 4 and 5 might be omitted, as the bill at that time before Congress had been withdrawn. The table shows that less than 20 percent of the membership had acted upon the report and it was inexpedient in the opinion of some members that the impression should go abroad that the result of the letter ballot was representative of the society. Some discussion was had on the pertinency of this objection and the causes for so small a representation, the inexperience of many members with both systems having doubtless restrained them from an expression of opinion which could not be supported by practical acquaintance with any other than the system adopted in their work. The matter was ultimately allowed to go on record without precipitating another discussion of the respective merits of the inch and the metre, both parties to the controversy finding comfort in the lack of votes, the one side being of opinion that the result demonstrated that a choice between the systems of inch or metric measurement was immaterial to the majority of the members and that the metre had no terrors in store for shop service, and on the other hand it was as confidently asserted that the sparseness of the voting showed conclusively that there was not the great demand for the adoption of the metric system that had been asserted by the prometric advocates.

C. W. Hunt presented the report of the committee on revision, which was received for transmission to the members, a letter ballot to be taken before the December meeting. C. H. Woodbury, who is representing the society at a meeting in Boston for the revision of the electric code, presented a communication which was placed on file. Prof. H. W. Spangler submitted a report of progress from the committee of the society on specifications for boiler plates, steel castings, etc., which is co-operating with committee No. 1 of the American Society for Testing Materials. The report is to be printed and distributed to the membership in view of the final discussion to be had at a later meeting.

Wrought Iron vs. Steel Crane Hooks.

A paper on a "Turbine Flow Recorder" by C. M. Allen, which had previously been presented at a meeting of the New York section of the society, and a contribution of "Some Data on Hoisting Hooks," by John L. Bacon, were considered, and the latter received some comment by F. A. Waldron and others. Mr. Waldron said that the Yale & Towne Mfg. Co. at his suggestion some two years ago tried steel hooks, but had found that the only material to be used for the purpose was high grade puddled iron. Mild steel might stand 25 to 50 percent greater tensile strain than wrought iron, but it was not so reliable when formed into hooks. The drop forging process was abusive of the material and wrought iron was

found to stand the shop treatment much more successfully. A defect in steel is not easy of detection, but if the iron bar was over or under heated the checks are evident and the hook may be promptly condemned. In actual use the iron hook will bend long before the point of rupture is reached, and in this way the hook serves as a safety valve when made the weakest point in the combination of chain and hook.

Strains in Tightening Nuts.

The short paper by A. Bement on "Strains Produced by Excessive Tightening of Nuts" developed some discussion regarding a remedy for this condition. Oberlin Smith pointed out, that where bolts were so required, a uniform strain might be had by the use of a spring balance and in most cases by proportioning the wrenches to the size of the nut and the average force which would be exerted by the workman good results could be obtained. It was, however, difficult to prevent the careless workman using a length of pipe or a sledge on the wrench. G. Henning in his shop experience in Baltimore had had a number of tanks which had been broken and had remedied the matter by using a large number of small belts in place of a few large ones, the bolts breaking in place of the tank. This arrangement had also the advantage that the distance between bolts being less, the tension on the bolts to prevent leakage does not need to be so great. Mr. Johnson suggested that the wrench manufacturers should give in their catalogues the distance between bolt centers in which the wrenches would work. F. A. Waldron was of opinion that a good deal of trouble came from a lack of spot facing, the nuts being bent to an angle and hence the bolt was the more readily broken.

The paper on "Fits and Fitting," by Stanley H. Moore disclosed the fact that the C. W. Hunt Co. and the General Electric Co. had recently reduced their practice in this regard to tabular form, and John Riddell, of the latter company, submitted some diagrams and criticism. John McGeorge inquired as to the practice in the different shops in regard to the various kinds of fits and whether the matter should be left entirely to the shop foreman. Fred J. Miller said that this was a question that had been discussed a good deal and he was of opinion that a rule that would always be right could not be laid down, so much depended upon the character of the work being done.

SHOP MANAGEMENT.

On Wednesday afternoon the papers by H. L. Gantt, of Schenectady, on "A Graphical Daily Balance in Manufacture;" by Charles Day, of Nicetown, Philadelphia, on "The Machine Shop Problem," and by Fred W. Taylor, of Philadelphia, on "Shop Management," were read and discussed. Mr. Gantt's paper is given elsewhere in this issue. Mr. Day's paper, which was of a piece with other contributions he has made to the solution of manufacturing problems, some of which have already appeared in these columns, was noteworthy for its use of graphic analyses of the details involved. For example, in plotting the means of attaining economical production in the shop Mr. Day made five subdivisions, namely, buildings, small tool equipment, tool room, machine tool equipment and management. He called attention to the absence of uniform development of the various departments of a business as the chief lack in modern manufacturing establishments. In developing his subject he took up each element in the problem and diagramed it, so that it stood apart from every other factor. The paper itself well illustrated the author's statement that "a comprehensive understanding of any problem can only result after an exhaustive study of the smallest details into which the problem can be subdivided. The success of modern methods in the accounting, as well as the productive, department depends on this."

"The balance of accounts of the yearly business," the writer said, "will unquestionably reveal the profit or loss, but gives no idea as to how to better conditions. A system of cost keeping, which gives the total cost of the different articles manufactured, may aid greatly in estimating, but will prove of small value as a check on efficient production. A system of cost keeping should not only give the present cost, but indicate how this figure may be lowered. To accomplish this end, each operation must be studied and recorded and each pound of material checked. The system must be alive and full of energy, as mere form is nothing.

"It must not be overlooked that shops that wish to be pioneers must do considerable experimental work, which, in turn, will result in the collection of facts and data to be at the disposal of those who are anxious to follow, the expense incurred being trivial compared with the advantages resulting therefrom. As we stated, however, the concerns that realize today the advantages to be derived from such management and organization will be benefited and will also reap reward in the next industrial depression. There is no standard that is attainable. Shops that lag behind, in order to make sure that each move is thoroughly justified, will arrive at the position occupied today by the pioneers only to find that the latter have grasped new principles and still lead in economic production."

Mr. Taylor's Paper.

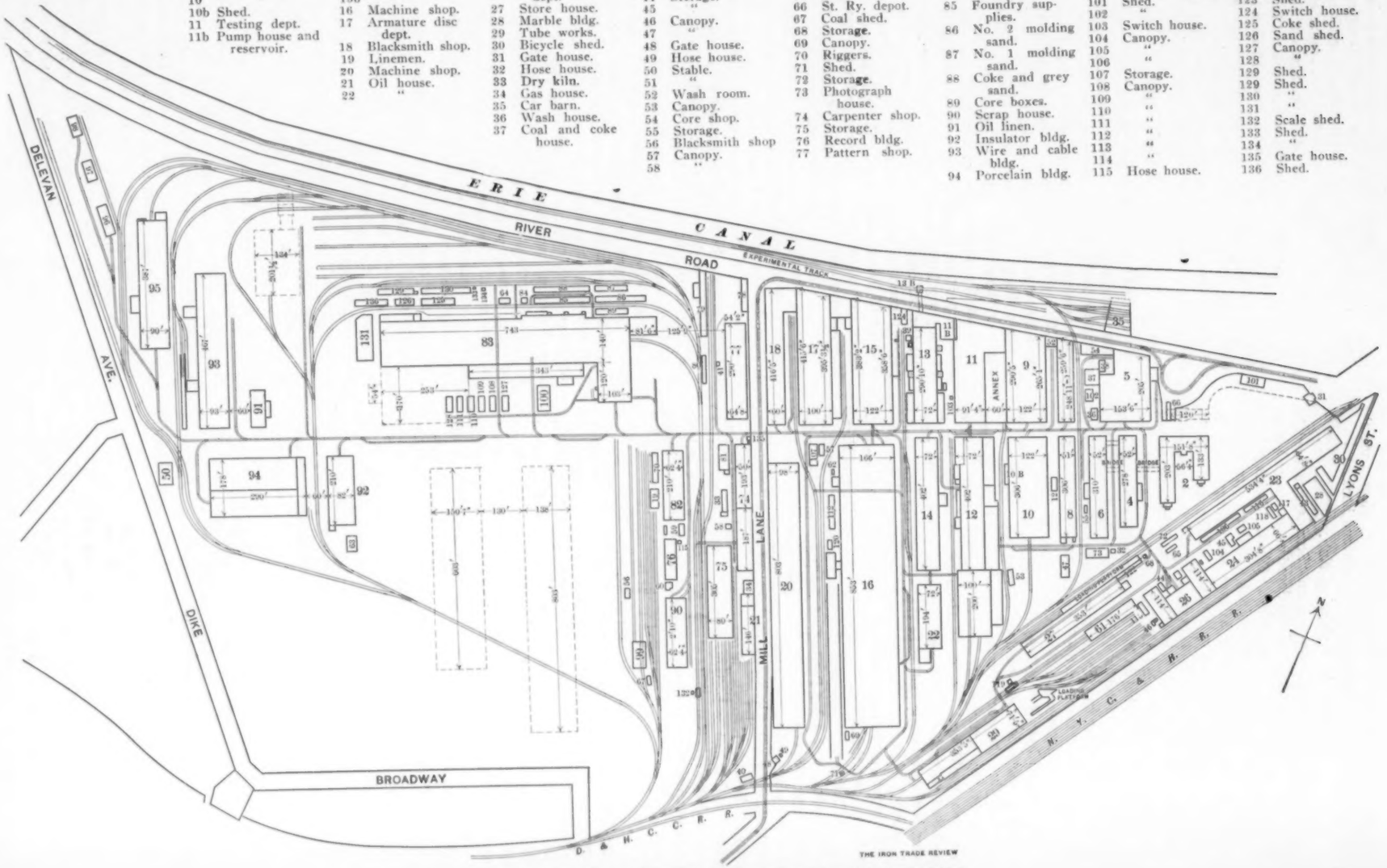
In a pamphlet of 120 pages Mr. Taylor amplified and in many particulars gave more emphasis to the cardinal points in his previous paper on a "Piece Rate System," which appears in the Transactions of the Society, No. 647, Vol. XVI, p. 856. The paper was accompanied by a thorough index and a synopsis of its contents. The chief object in writing it was stated to be to advocate the accurate study of "how long it takes to do work," or scientific time study as the foundation of the best management. The other important object in its preparation was the advocacy of coupling high wages for the workman with low labor cost for the employer. In the opinion of the writer of the paper these two latter conditions are not opposed to each other, and he considered that the existence or absence of the two elements forms the best index to either good or bad management. The possibility of coupling the two elements he considered to rest mainly upon the enormous difference between the amount of work a first-class man will do under favorable circumstances and the work actually done by the average man. The losses in manufacturing growing out of lack of the best system are due to two causes chiefly. First and by far the most important is the profound ignorance of employers and their foremen as to the time in which various kinds of work should be done —an ignorance largely shared by the workmen. Second, indifference of employers and ignorance of the proper system to adopt and the method of applying it, and as to the individual character, worth and welfare of their men. The tendency of the average man, in all walks of life, is toward a slow, easy gait in working, and it is only after a good deal of thought and observation on his part, or as a result of example, conscience or external pressure that he takes a more rapid pace. The tendency to "take it easy" is greatly increased by bringing a number of men together on similar work and at a uniform standard rate of pay by the day.

The paper then considered the objections to the contract system in shop work; referred to the failure of cooperative experiments; discussed the Towne-Halsey plan of recording the quickest time in which a job has been done and fixing this as a standard. Against day work, piece work or any modification of the latter, the writer offered the system he had developed, based upon accurate and scientific time study, and, as in his paper of 1895 on "A Piece Rate System," cited examples of what had actually been accomplished by the system, as answer to criticisms that it was largely theoretical. For each job, he argued, there is the quickest time in which it can be done by a first-class man. Under all the ordinary systems this quickest time is more or less shrouded in mist; but generally the workman sees it more clearly than the employer.

Under ordinary piece work the management watch every indication given them by the workman as to what the "quickest time" is for each job, and endeavor continually to force the men toward this "standard time," while the workman constantly use every effort to prevent this from being done and to lead the management in the wrong direction. In spite of this conflict, however, the "standard time" is gradually approached.

Under the Towne-Halsey plan the management gives up all *direct* effort to reach this "quickest time," but offers

1 Office Bldg.
2 "
3 "
4 Laboratory and offices.
5 Transformer dept.
6 Machine shop.
7 Brass foundry.
8 Machine shop.
9 "
10 "
10b Shed.
11 Testing dept.
11b Pump house and reservoir.
12 Testing and shipping.
13 Power station.
13b Conveyor.
14 "
15 Armature dept.
15b "
16 Machine shop.
17 Armature disc dept.
18 Blacksmith shop.
19 Linemen.
20 Machine shop.
21 Oil house.
22 "
23 Electric supply dept.
24 Electric supply dept.
25
26 Punch press dept.
27 Store house.
28 Marble bldg.
29 Tube works.
30 Bicycle shed.
31 Gate house.
32 Hose house.
33 Dry kiln.
34 Gas house.
35 Car barn.
36 Wash house.
37 Coal and coke house.
38 Canopy.
39 Oil shed.
40 Millwrights.
41 Canopy.
42 Wash house.
43 Marble shed.
44 Storage.
45 "
46 Canopy.
47 "
48 Gate house.
49 Hose house.
50 Stable.
51 "
52 Wash room.
53 Canopy.
54 Core shop.
55 Storage.
56 Blacksmith shop
57 Canopy.
58 "
59 Storage.
60 Scrap shed.
61 Store house.
62 Hose house.
63 Enamel bldg.
64 Rumbler shed.
65 Hose house.
66 St. Ry. depot.
67 Coal shed.
68 Storage.
69 Canopy.
70 Riggers.
71 Shed.
72 Storage.
73 Photograph house.
74 Carpenter shop.
75 Storage.
76 Record bldg.
77 Pattern shop.
78 Lumber shed.
79 "
80 "
81 Paint shop.
82 Pattern storage.
83 Foundry.
84 Ladle house.
85 Foundry supplies.
86 No. 2 molding sand.
87 No. 1 molding sand.
88 Coke and grey sand.
89 Core boxes.
90 Scrap house.
91 Oil linen.
92 Insulator bldg.
93 Wire and cable bldg.
94 Porcelain bldg.
95 Compound bldg.
96 Japan plant.
97 "
98 "
99 Locomotive house.
100 Pattern storage.
101 Shed.
102 "
103 Switch house.
104 Canopy.
105 "
106 "
107 Storage.
108 Canopy.
109 "
110 "
111 "
112 "
113 "
114 "
115 Hose house.
116 Canopy.
117 "
118 "
119 Scale shed.
120 Canopy.
121 Switch house.
122 Canopy.
123 Shed.
124 Switch house.
125 Coke shed.
126 Sand shed.
127 Canopy.
128 "
129 Shed.
129 Shed.
130 "
131 "
132 Scale shed.
133 Shed.
134 "
135 Gate house.
136 Shed.



PLAN OF THE GENERAL ELECTRIC CO.'S SCHENECTADY WORKS.

[VISITED BY THE MECHANICAL ENGINEERS, SARATOGA MEETING.]

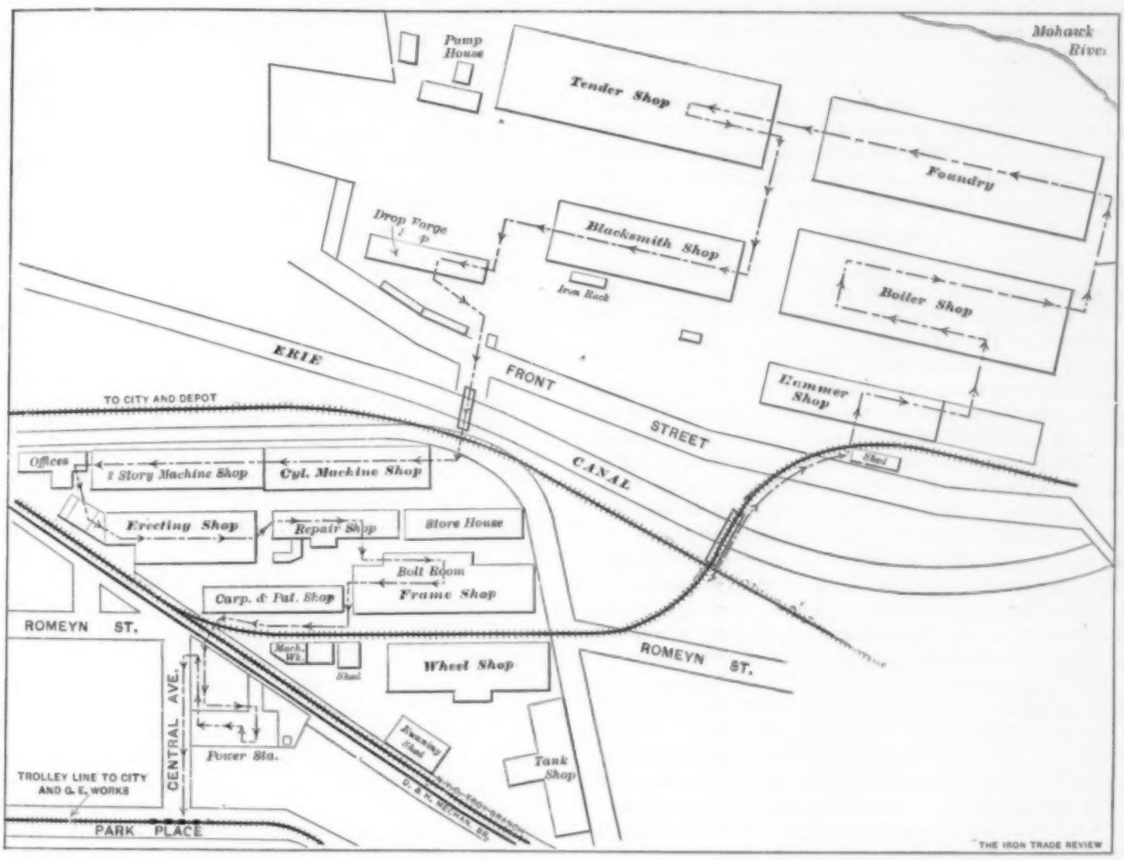
mild inducements to the workmen to do so, and turns over the whole enterprise to them. The workmen, peacefully as far as the management is concerned but with considerable pulling and hauling among themselves, and without the assistance of a trained guiding hand, drift gradually and slowly in the direction of the "standard time," but rarely approach it closely.

With accurate time study as a basis, the "quickest time" for each job is at all times in plain sight of both employers and workmen, and is reached with accuracy, precision and speed, both sides pulling hard in the same direction under the uniform simple and just agreement that whenever a first-class man works at his best he will receive from 30 to 100 percent more than the average of his trade.

Mr. Taylor then argues that the union of high wages and low labor cost can best be attained by the application of the following principles: 1. A large daily task. 2. Standard conditions. 3. High pay for success. 4. Loss in case of failure. When an establishment has reached an advanced state of organization, in many cases a fifth element should be added, namely: the task should be made so difficult that it can only be accomplished by a first-class man.

A marked advantage of the system of modern management advocated in the paper was said to be its freedom from strikes. "The writer has never been opposed by a strike, although he has been engaged for a great part of his time since 1883 in introducing this type of management in different parts of the country and in a great variety of industries. The only case of which the writer can think in which a strike under this system might be unavoidable would be that in which most of the employes were members of a labor union, and of a union whose rules were so inflexible and whose members were so stubborn that they were unwilling to try any other system, even though it assured them larger wages than their own. The writer has seen, however, several times after the introduction of this system, the members of labor unions who were working under it leave the union in large numbers because they found that they could do better under the operation of the system than under the laws of the union."

Examples were cited of the cost of work before and after the introduction of the Taylor system. Following this the author went into detail as to the changes in methods of management which the new way involved. Two sweeping changes were advocated: First—As far as possible the workmen, as well as the gang bosses and foremen, should be entirely relieved of the work of planning, and of all work which is more or less clerical in its nature. All possible brain work should be removed from the shop and centered in the planning or laying-out department, leaving for the foremen and gang bosses work strictly executive in its nature. Second—Throughout the whole field of management the military type of organization should be abandoned, and what may be called the "functional type" substituted in its place. "Functional management" consists in so dividing the work of management that each man from the assistant superintendent down shall have as few functions as possible to perform.



PLAN OF THE SCHENECTADY PLANT OF THE AMERICAN LOCOMOTIVE CO. BROKEN LINE SHOWS ROUTE OF THE ENGINEERS.

Mr. Taylor has subdivided the duties of the old "gang boss" into the four functions of "speed boss," "repair boss," "inspector" and "gang boss." It is the introduction of these four shop bosses directly helping the men that in his opinion has produced the greatest improvement.

The planning department is one of the most important factors in the new system. Its leading functions are:

A. The complete analysis of all orders for machine or work taken by the company. B. Time study for all work done by hand throughout the works, including that done in setting the work in machines, and all bench, vise work and transportation, etc. C. Time study for all operations done by the various machines. D. The balance of all materials, raw materials, stores and finished parts, and the balance of the work ahead for each class of machines and workmen. E. The analysis of all inquiries for new work received in the sales department and promises for time of delivery. F. The cost of all items manufactured with complete expense analysis and complete monthly com-

parative cost and expense exhibits. G. The pay department. H. The mnemonic symbol system for identification of parts and for charges. I. Information bureau. J. Standards. K. Maintenance of system and plant, and use of the tickler. L. Messenger system and postoffice delivery. M. Employment bureau. N. The shop disciplinarian. O. A mutual accident insurance association. P. Rush order department. Q. Improvement of system or plant.

There are plentiful suggestions in the paper as to how the system should be introduced and worked. "The worst mistake that can be made is to refer to any part of the system as being 'on trial.' Once a given step is decided upon, all parties must be made to understand that it will go whether any one around the place likes it or not. In making changes in system the things that are given a 'fair trial' fail, while the things that 'must go,' go all right."

The study of unit times is urged as the most important element of all. Without it, the definite, clear-cut directions given to the workman, and the assigning of a full, yet just, daily task, with its premium for success, would be impossible; and the arch without the keystone would fall to the ground. The art of studying "unit times" is quite as important and as difficult as that of the draftsman. It should be undertaken seriously, and looked upon as a profession. It has its own peculiar implements and methods, without the use and understanding of which progress will necessarily be slow, and in the absence of which there will be more failures than successes scored at first.

Discussion.

Mr. Taylor had said that the matter of systematic time study was the most important element in management and he had tried to impress that fact in his previous papers, but with little success. If the item failed to receive the consideration it deserved at the present meeting he should be sorry that he had mentioned anything else. William Kent in commenting upon this pointed out the cause lay rather in the fact that the members of the society were too busy to give the attention many of the papers deserved. It was the custom to specialize and to call in men like Messrs. Day, Taylor and Gantt to do this work and he thought that those who called in such assistance would in the future achieve the greatest successes.

Attention was directed by several speakers to the graphic methods illustrated in Mr. Day's paper, as they made very clear a complicated subject, the matter being seen at a glance which otherwise would require a number of pages of explanation. Mr. Caldwell thought that a method of illustrating certain routine in respect to manufacturing methods like the graphical treatment shown by Mr. Day would be one of the most useful things a manager could have before him. It could be carried out in many different ways so that the man in charge could from time to time refresh his memory as to the duties of the workmen. He could also have proper reference in the event of new men coming into the shop and by means of that graphic representation could show them how to pick up their duties quickly. The method brought out by Mr. Gantt suggested to him what was in their establishment known as the "pie-plate" system. It consisted of a series of racks divided off much as in the racks in a bakery and when an order came into that department it was placed in one of these shelves. Then it went from there to the credit clerk and when he disposed of it he would put it in the next compartment. Then it went to the clerk whose duty it was to look over the papers to see whether they were in proper shape to be written out and he transferred it to another compartment. The order progressed in that way until the work was completed in that department. The main advantage of the arrangement was that the manager in his visit to the department could examine the rack, and if he saw an accumulation of papers in any one department he would know at once that something was wrong. It was obligatory that at noon all the papers should be returned to their proper place. Several of the compartments had red circles drawn around them; these were considered danger points and indicated that papers must not be allowed to accumulate there under any circumstances. The system was uniformly carried out and the manager of the business could in his journey through the departments easily judge of the general condition of the work throughout the shop.

Mr. Ayres had had the system advocated by Mr. Gantt now in operation for over nine months and it had worked exceedingly well. There had been a great increase in output, and where previously he had found that the planing of shoes and wedges had held back the frames, he could now look over the sheets and, ascertaining what had held back the work, could bolster up that part. The same thing was true of the foundry and it was a fact that the output of the foundry had been increased 600 percent, although the rest of the shop had not shown any such increase. It might be thought from the statement that shows that the foundry had been doing very poorly before, but he wanted to give a great deal of credit for the showing to Mr. Gantt's system This statement elicited the comment from Mr. Gantt that a great deal of the credit was due Mr. Ayres and not the system.

Mr. Halsey said the paper suggested the manner in which the minds of men in different parts of the country turned to the same thing at the same time. The Stanley Electric Co. at Pittsfield had an entirely different system, but has embodied in it the general idea Mr. Gantt illustrated of keeping track of work done. In most places these systems are known as "follow up" systems and it seemed an appropriate name. The purpose of the system at the Stanley Electric Co. is to put before each foreman the date when each piece of work is to be finished, and if it fails to be out on time the clearing house gets at the reason, for the facts are before it and it can take proper steps to prevent any delay of the kind in the future.

Mr. Gantt, in reply to Mr. McGeorge, said that the proper person to put the red lines on the balance sheets was the superintendent of the shop. The system was in use at the American Locomotive plants and he had noted that in an order for 32 locomotives at the Brooks Locomotive Works in a lot of five or six thousand castings not more than twenty would be behind the schedule. The manager, Mr. Reed, had these sheets brought to his office every morning and examined them, made his comments and wrote a note to the foreman of the shops as to the manner in which the work was to be done. He personally put the red lines on the forms and the plan has been a success from the start. It was a success because the man in authority interested himself in it and knew from day to day, yes from hour to hour, what was being done in every department.

Trades Unions and New Shop Methods.

Mr. Taylor's paper on "Shop Management" was then discussed. Communications were read from H. R. Towne and E. F. DuBrul, the former expressing a keen interest in the subject, and intimating that in a system of gain sharing as advocated in his paper read some years ago there was a reward offered for material saved which was in his opinion as important as the saving of labor. Mr. DuBrul spoke of the tendency of labor unions and the greater difficulty of introducing methods of the kind proposed. He made a strong plea for organization of employers. He was followed by John T. Hawkins, who took up the claim of the paper that high wages and a low labor cost could go together. Under proper conditions that might be all right, but in this country today the conditions would not permit this. The efforts of employers to improve the conditions of manufacturing were opposed by the unions and labor leaders have said that they would not allow employers to make more money. He illustrated his remarks by an instance where he found difficulty in getting an estimate on the cost of molded glass until the manufacturer ascertained the pleasure of the union in regard to the matter.

Mr. Halsey did not wish to be thought oversensitive, but he could see no reason for hyphenating his name with that of Mr. Henry R. Towne. The premium plan was by no means the one proposed by Mr. Towne. It was of course difficult to draw hard and fast lines, but the plan of profit sharing advocated by Mr. Towne was not entirely satisfactory to him, though he considered the plan important. The fatal defect in the profit-sharing plan from his point of view was that the workmen obtained rewards to which they might not contribute. Mr. Towne in his gain-sharing system had lopped off that feature and had limited the operation of the plan to these items over which the workmen have control. However, he

dealt with the men as a body and divided the gains made in substantially the same manner as under the profit-sharing system. The system proposed by Mr. Taylor is a different system and what he has done in connection with the matter is in the direction of enabling him to obtain estimates with accuracy. But this is done with the premium plan, and in fact this offering of the premium plan on estimated time is a very common thing in Great Britain. There is a rate fixing department in the establishment of James Rowan & Co. in Glasgow. The time is studied, the rates are fixed and the premium is set in accordance with estimates. Doubtless this rate fixing is not done with the methods of analysis that Mr. Taylor uses, but the point is that the system is used on work that has not been done before and the statement that it is a drifting system, by which is probably meant that you simply take the rates of the workmen themselves, is unfounded. The leading difference between the premium plan and Mr. Taylor's system was in his opinion that Mr. Taylor tells the workmen how to produce the results that are expected, whereas the other depends upon the initiative of the workmen themselves. He had no doubt that there was a large field in which it would pay to use Mr. Taylor's plan and that in that field the plan would be better than the premium plan, but there is another and a larger field where you could not afford to put a ten thousand dollar man to figure on work that when you are done you won't get ten dollars for. The conditions met by Mr. Taylor at Bethlehem did not in his judgment furnish any criteria from which the general conclusion was to be reached that the system was applicable for all classes of work.

One of the members commented upon the high percentages of increased output and Mr. Oberlin Smith said it suggested the story of the Irishman who was in favor of buying two cook stoves on the undertaking that each would save fifty percent of the fuel and hence the pair would save the whole of it. He wished to congratulate the society and the writers of the three papers upon the splendid treatises they had had presented to them. He wished to say a word about the unions. The pessimists who expected that the efforts to improve methods and cheapen product would be foiled by the union would be mistaken. There are several elements that would rid them of these troubles. The men composing the unions, as they became better educated and associated with employers and engineers, would become more sensible. He felt that one of the greatest works that this society or any other could undertake would be to institute the teaching of a new political economy in the public schools and the next generation would not have the same trouble to combat. The New Zealand system was working well where unions of labor are fostered by manufacturers and encouraged by the government. Perhaps we should come to something like that in this country. Another element that is coming into operation was the organization of such bodies as the Metal Trades Association, which, although apparently formed to combat the unions, is really affiliating to some extent with them and bringing about greater intimacy with employer and employes.

Mr. Ayres said that his plant was unionized and that he had tried the plan of giving a bonus for good work. The men at first were suspicious of it, but now it is working satisfactorily. He had some notes of production which he only submitted as comparative between the old and the present condition and not of course the best that might be obtained elsewhere. He allowed a man 40 minutes on a boring job. His day rate was 22½ cents per hour. He did that work in 37 minutes and with the bonus allowed him the wages are increased to 26.6 per hour. The cost per piece was 17¼ cents, whereas it was previously 28 cents. This was in a locomotive works. He gave other instances where the wages had been increased with the output and at the same time decreasing the cost.

Mr. Taylor in closing the discussion said that the time study carried out systematically made all the difference in the world with the problem and the type of the reward you wish to give to the workmen. When you have exact observations you know where you are at. You want something upon which to base the premium you give; it must not be given haphazard. It does not require a ten thousand dollar man to take stop watch observations. The highest priced man he could call to mind for doing that work did not receive over $2,000 a year and he had had some very good men on that class of work at $12 per week. The system of functional foremanship he had explained; it implied, say, eight foremen to the one workman instead of the one foreman to each man. Take the case of a union workman who is doing complicated work on an elaborate machine tool. There would be a case in which it would be difficult to persuade or force men to accomplish the desired result. Take the case of the speed boss. The one duty of that man is to direct the men under him as to what speed shall be used, the feed and the shape of the tools. No union would dare to say to the management of that shop "You shall not run the machine at that speed." They do not go at it that way. They say, "You shall not work so fast." They never say that you shall not use such a tool or such a feed or such a speed. Now when your single workman under the supervision of your speed boss runs day after day on that speed and with that feed and gets the work out on time, as called for by the instruction card and a premium is kept for him in the office, you have a moral suasion on that man that is very powerful. At first he won't take that premium perhaps if it is contrary to the rules of the union, but as time goes on and the premium is piling up and gets to amount to a good big sum, he will sneak in and get it and the first thing you know you have a convert to your system. A single man may hold out against a foreman, but it was not conceivable that any man could hold out against a number of them concentrating their efforts. After you have got the one man then go for others. You cannot expect large results in six months. You must have patience and concentrate your first efforts on the one man. A vote of thanks was given the authors of these timely papers.

On Wednesday evening the members were entertained by the Jest and Song Club of Schenectady. Some good music was interspersed with considerable wit and was much appreciated by all present.

Bursting Speed of Emery Wheels.

Thursday several papers on the program were considered and the comments will be added when they appear in these columns. The paper by Prof. C. H. Benjamin on "The Bursting of Emery Wheels" appeared in *The Iron Trade Review* of June 25. In the course of the discussion Fred A. Waldron presented the following:

"This paper undoubtedly fills the long-felt want by giving reliable data relating to the actual strength of emery wheels. During the past year this proposition has been brought home to the writer most seriously as in the Yale & Towne Works, we have had three emery wheels burst in our iron foundry grinding room from different causes. In one case a man was killed, in the second another was seriously injured, while in the third outside of a large dent in the ceiling no injury was done. These three accidents occurring within a period of six months naturally raised the question as to what caused them. The writer was directed to investigate the causes of trouble and to devise remedies, and has established a method whereby whether through the carelessness of the men or from any inherent fault of the wheels or their mountings, accidents as serious as the above should be avoided. For the benefit of both those who are interested and of humanity at large, and as a fitting supplement to this excellent paper the conclusions so reached are reported as follows:

"1. That almost invariably as stated by Prof. Benjamin these accidents are due to the carelessness of the operator.

"2. That grinding machines as a class are given less attention than any other machines in the factory.

"3. That comparatively few manufacturers provide protective guards for their operators.

"4. That improper rests are probably the cause of more accidents than any one thing.

"5. That a tendency prevails to speed up large and heavy wheels—often improperly balanced on too light a frame.

"6. That it is the tendency of almost every operator to use the emery wheel truing device, and it seems to have a special attraction for a new man in the business.

"7. That it is the tendency of all piece-work operators in grinding room to exceed the working speed limits of the wheels which they use.

"To avoid accidents, the following plan was adopted:

"1. All grinding machines throughout the entire factory had their speeds scheduled, numbers given to the machines, and a record of the same kept in the office.

"2. All requisitions for emery wheels must state on them the number of the machine on which the wheel is to be used. The list in the office is then referred to, and if the size of this wheel comes within the proper limits of periphery speed for the particular machine the requisition is passed to the purchasing agent.

"3. Light steel guards obtainable in the open market have been placed on all machines as far as practicable.

"4. A special machine has been designed for 16-inch wheels, with a very large spindle and ring oiling bearings and extra heavy base bolted to 4x6-inch timbers laid in concrete. This is provided with substantial rests and one speed only is provided for each machine. After the wheel is worn down, to a certain diameter, it is transferred to the next machine which makes a greater number of revolutions per minute. Back of each of these machines a placard is posted on which is stated the number of r. p. m., and maximum diameter of wheel which is permitted to be used on it. Grinders with cone pulleys are being discarded.

"5. The emery wheel dresser is kept under lock and key, and *one man* is held responsible for the truth and balance of all wheels.

"6. Use of wheels with large holes, say above 2-inch holes for 16-inch wheels, has been discontinued.

"With these precautions, it has been found that large wheels can be easily speeded to 6,000 feet per minute at the periphery, with perfect safety to the operator, and a corresponding increase in production. In the light of these tests by Prof. Benjamin, it is evident that a liberal factor of safety has been provided by reputable makers of emery wheels, and that as a general proposition the bursting of emery wheels is directly traceable to carelessness on the part of the operators, and indirectly traceable to improper mountings, badly designed, and poorly adjusted rests and improper and ignorant handling of the emery wheel dresser."

During the session a communication was read from the Pensylvania Railroad Co. in regard to a number of locomotive tests to be instituted at St. Louis next year and inviting the society to appoint a committee of three members to act with a like committee to be named by the Railroad Master Mechanics' Association in supervising the tests. The invitation was accepted and the president named E. M. Herr, W. F. M. Goss and J. E. Segue as the committee.

Visit to the American Locomotive Works.

There was the usual reception on Thursday evening and on Friday morning the party left Saratoga by special train for Schenectady. The train entered the American Locomotive Works near the hammer shop and from thence the party was conducted through the plant, taking the buildings in the following order: Hammer shop, 650x85 feet; boiler shop, 650x175 feet; foundry, 650x175 feet; tender shop, 650x175 feet; blacksmith shop, 400x125 feet; drop forge shop, 252x45 feet; cylinder shop, 350x85 feet; machine shop, 366x81 feet; brass foundry, 30x45 feet; erecting shop, 317x66 feet; erecting shop gallery, 234x36 feet; repair shop, 268x51 feet; office and store building, 250x60 feet; frame shop, 384x100 feet; carpenter and pattern shops, 162x54 feet; machine shop, 75x45 feet; lumber shed, 45x57 feet; power house, 184x77 feet.

The foundry of the American Locomotive Works has a capacity of over 5,000,000 pounds of castings per month. The works was of special interest following the paper read by Mr. Gantt and his graphical balance was found doing good service in the departments of the shop. The erecting shop was particularly free from stacked parts waiting for attention and this freedom of the floor showed at the best what manufacturing an unwieldy machine of the proportions of a modern locomotive really meant. All the material has been scheduled to arrive at the erecting shop when it is required and parts are seldom begun late and this clockwork regularity means something where two finished locomotives go out of the shops every day.

General Electric Co.'s Plant.

The party left the works by trolley for the Mohawk Golf Club at noon for lunch, the ladies having preceded them to this point, and afterwards went to Union College, where other professional papers were scheduled. Then a hurried trip was made through the mammoth plant of the General Electric Co. where over 1,200 workmen are housed in a single building out of the many workshops. These are outlined on the accompanying plan and afford some idea of the extent of this enterprise. Some of the members were disappointed at the lack of an opportunity to inspect the construction and manufacture of the Curtis steam turbine which was recently been undertaken at this plant. The General Electric Co.'s plant was started with the removal to Schenectady of the Edison Machine Works from New York in December, 1886, and has now a capacity from small switches and lamp sockets up to generators of 7,500 k. w. and the report for last year shows that a business valued at $36,000,000 was done. The power station has an equipment of twenty-two boilers of 7,800 h. p. aggregate capacity and there are eight large units—direct connected engines and dynamos—and several small units, having a total capacity of 8,000 h. p. A very complete coal and ash handling system is installed. In addition to these engine driven generators there are five 450 rotary converters changing alternating current, which is generated at Mechanicsville on the Hudson, 18 miles away, into direct current at 250 volts. This station, large as it is, cannot furnish as much power as is required and is soon to be supplemented with a new station equipped with four steam turbine generators of 1,500 k. w. capacity each.

Building No. 16, where most of the heavy machine work is done, is 165 feet wide by 850 feet long, and it is 66 feet high to the top of the roof. The center bay has a span of 65 feet and the work is handled by one 50-ton, two 40-ton and one 15-ton cranes. One of the side bays is fitted with three cranes. A very interesting feature of this building is the extensive use of portable tools. There are 25 of these tools, which consist of slotters, milling machines, drills and shapers, and there are about 12,000 square feet of floor plates which are arranged for the use of these portable tools. Each of these machine tools is driven by an independent motor mounted directly on the machine. The 60-foot boring mill in this building is interesting and was described in a paper read by Mr. John Riddell at this meeting. The large electric locomotive under construction in the rear of the building is also worthy of note. There are two locomotives and they may be coupled together to make one unit as the system of control is such that one man may operate any number from one controller. Each locomotive will weigh 160 tons and is intended to haul a 1,500-ton train up a 1.5 percent grade at 10 miles per hour. The capacity of one locomotive is 2,000 h. p.

The members returned to Saratoga by special train and in the evening the remaining professional papers received attention and a session presenting many profitable features was brought to a close.

The Lock Haven Fire Brick Co., of Lock Haven Pa., is to be incorporated in Pennsylvania by David Salmon, Geroge Salmon, formerly superintendent of the Queen's Run Fire Brick Co., and Charles C. Kreamer and the Stowe-Fuller Co., of Cleveland, O. These interests are experienced fire brick manufacturers. A twenty-six acre site has been secured in Lock Haven, and work has already begun in opening up the large clay deposits and erecting the plant. The company controls a large teritory of well-developed clay property and will own its own coal land. The plant will probably be running by the first of the year.

A. Fisher, of Macomb, Ill., has carried on a foundry and machine shop business for the past 30 years, and in that time has made a specialty of school, church and opera seat castings, in addition to the manufacture of pottery machinery. A cast iron field roller for farm use has been manufactured at these works throughout the 30 years of Mr. Fisher's foundry experience. Pottery machinery from the Macomb plant has gone into every State in the Union in which potteries are operated. In the Fisher machine shop a general repair business is carried on, a considerable force of skilled workmen being employed.

The Eastern Machinery Market.

OFFICE OF *The Iron Trade Review*,
ROOM 1909, NO. 150 NASSAU ST.

NEW YORK, June 30.—Machinery houses in this vicinity are almost a unit in saying that June was less productive of orders than any month of the present year. The month was ushered in with high hopes, because it was known that there were some good propositions on the verge of being given to the trade; but at the month's close they are still unplaced. The quieting down in business is attributed to the labor troubles in the building trade, which have been especially numerous in this city, and to apprehension which the severe decline in values in Wall Street caused.

In machine tools orders for single tools have been a feature. Usually where this has been the case, the totals for the month gave satifaction, but many houses say June was an exception in this respect. Competition of the keenest character was seen for such business as was offering, and the search for new orders meant more hustling than has been seen for a long time. Every house had its full quota of salesmen on the road, endeavoring to book as many orders as possible before the extremely warm weather set in. It was expected that the Loomis-Pettibone Co. would give some of the orders for the $150,000 to $200,000 worth of machine tools it intended installing in its proposed plant at Elizabeth, N. J., the specifications for which have been in the hands of the trade for nearly two months. It may be that the company will need few if any of the tools covered by the specifications. We have it on the highest authority that the plan of building a new plant may be abandoned, negotiations being under way for the purchase of one that is already in operation and suitable for the business proposed, which is the manufacture of gas engines, gas generators, and electric generators and motors. While the company acquired the site for the new plant several months ago, it is a fact that nothing as yet has been done toward laying it out, nor will anything be done until the negotiations referred to are closed, which will probably be within three weeks at the latest.

There were reports during the month that the International Steam Pump Co. had given or was about to give some orders for equipment for the new plant of Henry R. Worthington at Harrison, N. J. One of these was that the Niles-Bement-Pond Co. had received the order for the cranes, which will aggregate some $200,000. An official of the company denied the report, but in the trade it is generally conceded that the Niles company will get the order when it is given out. The machine tool specifications have not been given out, but the trade expects the Niles company to carry off the bulk of the orders, when the specifications are given out, if they ever are. Altogether the equipment will mean an outlay of some $500,000.

Machine tool men are anxiously waiting to hear from the General Electric Co. in connection with the purchases it is going to make of tools for the new additions to its plants at Schenectady, N. Y., and Lynn, Mass., mention of which has already been made in *The Iron Trade Review*.

Railroads were buyers of machine tools in small quantities during the past month, but there is still a large number of propositions from this source which the trade expected to have in its hands by this time, but has not yet received.

Engine builders found June very inactive. This was particularly the case with engines for buildings in course of erection in this city. This is a department of the trade which has been brisk during the past year, but with which labor troubles have played havoc recently. The MacKenzie, Quarrier & Ferguson Co., of No. 114 Liberty St., who are the local representatives of the Harrisburg Foundry & Machine Works, make a specialty of this class of trade, and say there has been a notable falling off in orders of late in the East. The chief orders taken by this firm during June include the following: One 50-k. w. and one 75-k. w. engine for the Madison Square Building, this city; one 50-k. w. and one 25-k. w. engine for the Oliver Building, Boston, Mass.; and two 75-k. w. and one 50-k. w. engine for the Bailey Building, Philadelphia, Pa.

Makers of electrical equipment note only a slight falling off in their business during June, due to labor difficulties. Shop installations are a source of some good orders, and the demand for complete lighting plants continues excellent. The large companies say trade with them is as good as it has ever been, with street railway companies their best customers.

Much of the dullness heretofore noted in the export machinery trade was lifted during the past month. The volume of orders remained about the same as for months past, but it was noticeable that some manufacturers who have not given any attention to extending their business abroad for some time past, did so during June. The American Machinery & Export Co., of No. 120 Liberty St., says all its agents in Europe find little demand for American machinery there at the present, and speak of having noted more American firms in search of orders abroad during June than in many months.

The Ingersoll-Sergeant Drill Co., of No. 26 Cortlandt St., booked some very large orders in June and is about to close some good contracts.

The Niles-Bement-Pond Co. reports that business for June was up to that of former months. Railroads made some good purchases of this company's tools, the most extensive being by the Chicago & Eastern Illinois Railroad of machine tools for its new shops at Danville, Ill.

The Birmingham Machine & Foundry Co., of No. 122 Liberty St., closed some good contracts during the month for sugar machinery for use in Cuba.

The Lunkenheimer Co., of No. 26 Cortlandt St., received many large orders recently for its sight feed lubricators and oiling devices. The company's order books now insure the operation of its plant for several months to come at its fullest capacity.

The New Haven Mfg. Co., of New Haven, Conn., has made a number of additions in the way of new or special machines and has replaced nearly all its former styles with up-to-date tools such as it builds. New and much larger boilers are also being installed. This company notes that there is an unsettled feeling in the machine tool trade as well as in others. Regarding the general business outlook, it is optimistic, but at the same time feels that there is considerable uncertainty as to the immediate future. The company is pretty well sold out of machines for early delivery and does not seem able to catch up or accumulate any stock. The inquiries and orders do not seem to be quite as liberal as heretofore, although for the past six months business has been rushing and sales far in excess of previous half-year periods.

The Potter & Johnston Machine Co., of Pawtucket, R. I., is very busy on all its lines of machines. June orders have been very gratifying and the healthy present inquiry indicates that the future is bright. Recent additions to this plant give about 5,600 feet of new floor space, which will better permit of handling the increased volume of business.

At the Brown & Sharpe Mfg. Co.'s extensive shops, Providence, R. I., the early part of June showed a little letting up, but of late orders have been placed very freely and inquiries are constantly received indicating that good business will come out of them. The company feels that prospects are very bright in all lines.

The Binsse Machine Co., Newark, N. J., found that the strike agitation affected business unfavorably, but since the settlement of many of the strikes inquiries and orders have increased again. The Binsse company considers the outlook favorable for good business until the end of the present year.

June showed some falling off in the business of the Baush Machine Tool Co., of Springfield, Mass., but the plant is still busy and orders are now beginning to come in again in better volume. The general business outlook does not appear to it quite as favorable as in months past. Additions were made to this plant in May.

The Woodward & Powell Planer Co., of Worcester, Mass., is adding some machines to its outfit and recently has purchased a tract of land adjoining its present shop site with the expectation of putting up a large additional building. The company has all the business it can attend to, being five or six months behind on large sizes and about three months behind on small sizes of planers.

The Whitcomb Mfg. Co., Worcester, Mass., finds business holding up very well, though it has heard of a slight slackening up in other lines recently. It considers the outlook for business in the machine tool line to be good.

Gould & Eberhardt, of Newark, N. J., are having a steady

demand for shapers, drill presses and automatic gear cutting machines, particularly in the larger sizes, although inquiries are dropping off slightly. Business with Germany is still slack, but some good orders have come recently from England for shapers and gear cutters.

Business with the Bayldon Machine & Tool Co., of Jersey City, N. J., fell off in a marked way in June, and July and August are expected to be unusually dull, contrasting with the corresponding months of last year, which were quite active.

Flather & Co., Inc., of Nashua, N. H., report that up to June 1 the orders received this year were very much larger than in any other year up to that date. Since June 1 there has been some falling off, but there is still a fair amount coming in, and the company is quite willing to have the lull, being more than four months behind orders.

The Fellows Gear Shaper Co., of Springfield, Vt., expects the total of orders booked in June to exceed that for any previous month in its history. Foreign business shows no change, but domestic orders have increased largely and the company considers the general business outlook excellent. It is running 22 hours a day, but is unable to keep up with orders.

The Gruson Iron Works, with works and general offices at Eddystone, Pa., are now known as the Eddystone Foundry & Machine Co., the change having taken effect June 1. The Philadelphia office is at 1103 Penn Square Bldg. Thos. Prosser & Son., of New York, are general sales agents.

The Hendey Machine Co., of Torrington, Conn., writes: "Our business, through the present year, has been fully up to what it was a year ago, possibly a little more, and it still continues good. We have all we can possibly do. We are having considerable export business, especially from Great Britain. We have been considering for the past six months building another addition to our works, but owing to the labor conditions and other things we have decided not to do anything with it this year. We are developing our plans to take the work up another year. It seems to us the general outlook for business was never better, the only cloud on the horizon being the difficulties with labor, which, however, we hope are at their height and from now on will diminish somewhat."

The W. P. Davis Machine Co., of Rochester, N. Y., says: "We have had a strike on for over two months and are not in position to judge of business conditions as well as if we had been running in our normal condition. We believe that the machinery dealers are getting well filled up with all the lines of machinery they require, while, as you are probably aware, it was not possible for them to get tools as fast as they wanted them for the past few months. We have orders ahead for many months to come, which, in a great measure, is owing to the fact that we have not been able to turn out our work as fast as usual. Foreign trade is very light at the present time, and as far as we can learn from the different manufacturers we have talked with, they are all getting in position to fill orders promptly, which shows there is a dropping off in business. We have no doubt that this has been brought about in a great measure by the various strikes that are occurring all over the country. While business in a general way is in excellent condition, manufacturers are getting more conservative and are not buying the machines that they could use if they were assured of not being interfered with in their business. We think it is the general feeling among manufacturers that they had rather do less and run their own business than be in a position where they can be dictated to by the business agents of the various trades unions. So far as our own strike is concerned, since the injunction was granted we have had no trouble from the union and we are running along in the usual way, but with only about 50 percent of our usual number of men. We think it is fair to presume that business will not be so good the coming year as it has been the past year, although if there is no serious trouble from organized labor there will be a fair amount."

At the by-product coke oven plant of the Semet-Solvay Co., at Ensley, Ala., a plant is being installed for the manufacture of sulphate of ammonium which will be supplied to the fertilizer manufacturers of the South.

PIPE-CUTTING AND THREADING MACHINES.

From time to time there is a demand that certain features be developed in a machine. In response to such demand the Bignall & Keeler Mfg. Co., of Edwardsville, Ill., has made the Peerless special improved pipe cutting and threading machine. This corresponds somewhat to the Peerless No. 3 but is one size smaller and was designed to meet the trade for a machine that would be in the same class as the Peerless Nos. 3 and 4. There has also been an inquiry for a machine of higher speed than is ordinarily found on a pipe machine. This also has been met in the present machine. It was also designed to thread either pipe or bolts and as it is strong in all its parts it will stand being run at the highest speed limits in which it would be possible to make good threads. There are eight speeds available and the cone pulley can be arranged for either cross drive or horizontal to the arbor, as shown in the cut. A universal chuck is placed on the front end of the arbor and a self-centering scroll chuck on the rear end. The steady slides are strong and can be

PIPE-CUTTING AND THREADING MACHINE.

used for removing the couplings from the pipe. The gears are all machine cut from the solid. All of this company's machines may be equipped with motors when desired.

New Rail Rolling Record.

The south works of the Illinois Steel Co., Chicago, beat its own and all other records June 24 for amount of steel rolled in 12 hours. In the Bessemer department 175 heats were made and the total tonnage was 1,894 tons. This is an increase of 122 tons over the previous record, which was 162 heats and 1,772 tons. In the rail mill department the record was beaten by 126 tons. In 12 hours 1,594 tons of rail were rolled, the best previous record for 12 hours being 1,468. The rails were 85 pounds to the yard and 30 feet in length. There was much rejoicing on the part of officials and workingmen.

The Bignall & Keeler Mfg. Co., Edwardsville, Ill., has had in the past month nearly double the business of the corresponding month last year. Orders now booked will keep their shop running full handed for several months and it is noted that inquiries are as numerous as heretofore. Recent orders include 15 pipe threading and cutting machines to be shipped to California and one to be shipped to England.

Exclusive of those used for railways, automobiles, elevators, and fans, there are over 60,000 motors, ranging from ⅛ h. p. to 2,000 h. p., in daily operation in the United States, supplying over 1,000,000 h. p., and representing an investment of about $12,000,000.

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market and Some of Their Wants:—

The W. N. Durant Co., Milwaukee, capital $15,000, has been incorporated to manufacture machinery, tools and machine supplies.

The Dayton Foundry Co., formerly a partnership, Dayton, O., has been incorporated under the laws of New Jersey with a capital stock of $75,000. The officers are: Louis Pflum, president; John Stauffer, vice president; William D. Walker, secretary-treasurer. The directors are: Louis Pflum, John Stauffer, William D. Walker, Kenneth McLaren and John C. Shea. The partnership had been operating a plant for 8 years, but the increase of business made it imperative to obtain more room and better facilities, hence the decision to incorporate.

The Victor Adams Mfg. Co., Little Falls, N. Y., has changed its name to the Little Falls Mfg. Co., and has increased its capital from $5,000 to $100,000.

The Pittsburg Cast Iron Brazing Co., Allegheny, Pa., has been incorporated with a capital of $15,000.

The Davies Car Wheel Co., Wheeling, W. Va., has been incorporated with a capital of $100,000. W. H. Bradley will probably be president.

The Moore Co., Columbus, O., capital $10,000, has been incorporated to deal in tin plates, sheet iron, metal goods, etc. Incorporators are: C. C. Moore, Geo. W. Sparks, Hayes L. Jones, M. W. Redding and R. C. Moore.

The Blackstone Machine Co., Providence, R. I., has been incorporated with a capital of $25,000.

The Riverside Foundry Co., Kalamazoo, Mich., recently incorporated with a capital of $10,000, is owned by several windmill corporations, and the foundry will make wind mill castings. The building has been purchased and will be altered and equipped as a modern foundry.

The Standard Foundry Co., Buffalo, has been incorporated with a capital of $10,000. The directors are: Edmund B. McKenna, Ralph Kimberly and Frederick H. Williams.

The Long Mfg. Co., Chicago, capital $15,000, has been incorporated to manufacture machinery.

The Flexible Shaft & Tool Co., Bellefontaine, Ohio, capital $20,000, has been incorporated by William S. Short, Riley A. Shafer, J. C. Hoover, John P. Aikin and Don Aikin.

The Bruno Bale-Tile Machine Mfg. Co., New York, capital $10,000, has been incorporated to manufacture tools. Incorporators are: Paul Goepel, Frank E. Boyce, Peter J. Sauer, all New York City.

The American Plow Co., Madison, Wis., has been incorporated with a capital of $200,000. The company will build a plant at Madison to manufacture farm machinery.

The International Construction Co., Detroit, Mich., capital $100,000, fully paid in, has been incorporated to build and construct electric light, railway and power plants, canals, public works and steam railway works.

The Dean Mfg. Co., Seymour, Wis., capital $20,000, has been incorporated to manufacture engines and boilers.

The Providence Steel Casting Co., Providence, R. I., capital $150,000, has been incorporated.

The Excelsior Machine Works Co., Wellston, Ohio, capital $3,000, has been incorporated.

The Holliday Mfg. & Engineering Co., Chicago, capital $15,000, has been incorporated to manufacture and erect machinery.

Fires and Accidents:—

Fire totally destroyed the new plant of the Imperial Wheel Co., Dyersburg, Tenn., June 19. Loss $3,000. The company will rebuild.

Fire occurred June 27 at the Shenango works of the American Tin Plate Co., New Castle, Pa. The fire was either of incendiary origin or resulted from spontaneous combustion. The loss is estimated at $25,000. No. 3 engine house of the hot mills where the fire originated was badly damaged and the ten hot mills to which it furnished power cannot operate for some time. The other twenty hot mills will be in operation as usual.

Lightning struck the Gem City Stove Foundry, Quincy, Ill., June 25, causing considerable damage. Work in the foundry was not interrupted.

Fire almost totally destroyed the plant of the Riddle Coach & Hearse Co., Ravenna, O., June 28. Loss is estimated at $200,000, insurance $25,000.

The foundry of the Duplex Mfg. Co., recently completed at Elyria, O., was destroyed by fire June 27. The loss amounted to about $6,000, fully covered by insurance.

New Construction:—

The new foundry of the Mansfield Engineering Co., Mansfield, O., is now in operation. The new pattern room will soon be completed.

The Gas Engineering Co., Collinwood, O., formed by Ft. Wayne, Ind., capitalists, will build a plant for the manufacture of gas engines.

Patterson Bros., structural iron contractors, have begun the construction of the spike mill for the Colorado Fuel & Iron Co., at Pueblo, Colo. The building will be 136x100 feet. The frame work will be of iron.

Work has commenced on the new addition to Foote Bros.' machine shop, Nunda, N. Y. The company will hereafter be known as the Foote Mfg. Co., and will be composed of Charles G. Warner, H. W. and O. J. Willard, Fred G. Olp and C. E. and C. T. Foote.

Assistant Chief Engineer A. R. Raymer, of the Pittsburg & Lake Erie Railroad, has announced that the contract for the construction of the new shops and trainmen's quarters at Hazelton, Pa., has been awarded to the Nicola Building Co. The shops will cost about $20,000 with an additional $20,000 for equipment. Work will be commenced at once.

E. C. Atkins Co., manufacturer of saws at Indianapolis, Ind., contemplates the erection of a crucible steel plant.

C. Wilson & Son, Toronto, Canada, whose foundry was recently destroyed by fire, will build a much larger foundry, up to date in every particular. They are now using a leased building.

The Russell & Erwin Mfg. Co., Dayton, O., contemplates making an extensive addition to its plant, in which screws are manufactured.

The Chattanooga Roofing & Foundry Co. has during the past six weeks expended about $25,000 in machinery and new construction. A complete galvanizing plant has been installed. The manufacture of iron shingles is a specialty of this company.

George McNaul & Co., Philadelphia, will erect a galvanizing plant 50x100 feet at a cost of $20,000.

D. R. Sperry & Co., Batavia, Ill., have purchased a tract of land and will erect a modern plant. The main building will be 70x225 feet for the foundry and machine shop. Office, pattern shop and store house will also be erected.

The Bradford Machine Tool Co., Cincinnati, will erect an addition 65x100 feet, two stories, brick.

The Newell Sanders Plow Co., Chattanooga, Tenn., has completed its foundry addition at a cost of about $10,000. A new office building is also being erected.

The Star Mfg. Co., Zanesville, O., has commenced work on the extension of its foundry, which will nearly double its capacity.

The Holland Horseshoe Co., recently organized by citizens of Binghamton, N. Y., to manufacture a patent horseshoe, expects to build a plant, and has not yet decided whether it will build in Binghamton or some other city.

The Drake & Stratton Co., railroad and stripping contractor, with its Mesabi range headquarters at Hibbing, Minn., has acquired a site and commenced the erection of a machine shop, warehouse and blacksmith shop. The machine shop will be 32x60 feet, and will be equipped with modern machinery.

The Washington Iron Works Co., Seattle, Wash., has

about completed improvements and additions to its works, costing about $150,000. The new machine shop is 70x240 feet, two stories. It is being equipped with a 25-ton electric traveling crane and other modern machinery. A new addition 60x100 feet, has recently been added to the foundry, and another cupola installed. The company makes a specialty of logging and hoisting machinery.

The Great Northern Railroad Co. contemplates the erection of extensive car repairing shops at Helena, Mont.

Contracts have been awarded for the large addition to the plant of the American Car & Foundry Co., at Detroit. There will be a building 340x95 feet, one story, 40 feet high, steel construction, with slate roof, automatic fire extinguishers and other improvements, to cost $90,000; an addition to the power house, of steel construction, 28x54, $7,000; a paint shop, 82x35, $3,000.

A considerable part of the foundations for the new blast furnaces for the Jones & Laughlin Steel Co., Pittsburg, has been put in, and will soon be ready for the superstructure. The company is also proceeding with the construction of the four additional Talbot open-hearth furnaces.

Extensions to the Eleanor Iron & Steel Co. works at Irwin, Pa., are being considered which will make that plant one of the largest in western Pennsylvania. It is proposed to increase the capital to $1,000,000. The concern has enough land to erect large additions.

The Waterous Engine Works Co., St. Paul, Minn., has secured a permit for the erection of a building 75x200 feet on the site of the structure recently destroyed by fire.

The Lackawanna Steel Co. has 7,000 men at work on the building of its great plant at Buffalo. Directors of the company state that every effort will be made to begin steel making on Oct. 1.

The Paden Valley Land Co., Paden Valley, W. Va., has closed a contract with the Pittsburg Steel Casting Co. to locate a plant at Paden City, W. Va.

Ground has been broken for the American Sad Iron Co.'s buildings at Milan, Mich. This concern was the Detroit Register Co., and will move its plant from that city to Milan. The main building is to be completed within 60 days.

The Acme Foundry Co., Detroit, recently incorporated, expects to build at an early date, but the plans are not yet completed.

General Industrial Notes:—

The machine shop of the Chattanooga Machinery Co., Chattanooga, Tenn., which has been in course of erection for the past two months, is nearly completed. The new foundry has been in operation for about two weeks.

The American Car & Foundry Co. has received new orders for cars as follows: St. Louis Southwestern, 2,000 box; St. Louis & San Francisco, twenty-seven coaches, six chair, six postal and one cafe car, and miscellaneous orders for 113 cars.

The Terre Haute plant of the American Car & Foundry Co., has secured the contract for one year from date for supplying the castings for the C. & E. I. railroad shops, at Danville, Ill. The work was formerly done at Danville.

The Indiana Foundry Co., South Bend, Ind., is now in operation. The plant is equipped with modern appliances.

Martin Powers and J. F. Sullivan, of Stillwater, Minn., have formed a partnership and purchased the business of the estate of the late Charles August Staples, of that city, and will engage in tin and sheet iron manufacturing.

The Akron Iron & Steel Co., Akron, O., has sold to the Wellman-Seaver-Morgan Co., 34 acres in South Akron. The purchasing company desired the additional land in connection with the proposed improvements to its plant.

The La Belle Iron Works, Steubenville, O., expects to start the large pipe mill not later than July 15. The mill is equipped to turn out a line of merchant pipe 8, 9, 10 and 12 inches in diameter.

C. L. Buckingham and Arthur T. Herr, of Denver, and John T. Holmes, of Detroit, Mich., are promoters of a company which proposes to erect a plant in Denver, to make steel castings, as soon as the site is procured.

The works of the Liggett Spring & Axle Co. will be started in operation about Sept. 1. About 1,000 will be employed and the works will have an annual capacity of about 800,000 steel axles, as well as about the same output of steel springs. The works have been building for the past eight months. The site is directly opposite the borough of Monongahela, near Pittsburg. The town which is springing up at the new works is known as Axleton. The present small plant in Allegheny will be moved to the new site as a new addition to the recently installed equipment.

The Crown Machine Works, Terre Haute, Ind., is preparing to erect a new plant, a lot having been presented by the Commercial Club of that city. A building 50x200 feet will be erected. The company went to Terre Haute from Dayton, O., about two years ago.

The Hedford Bros. & Hitchins Foundry Co. has changed its place of business from Dubuque to Waterloo, Ia., and has increased its capital stock from $5,000 to $25,000.

The Lookout Mountain Iron Co. developing at Battelle, in DeKalb County, Alabama, will within the next three weeks start up 100 coke ovens. The foundations for the new blast furnace at Battelle are now in, and it is expected that the construction will progress steadily.

The plant of the McKeesport Foundry & Machine Co., located on part of the ground recently sold to the National Tube Co., has been dismantled and the machinery moved to the new plant on First Ave. The company made its first casting fourteen years ago.

The Otis Elevator Co. has been awarded the contract for elevators for the new Chicago federal building. The amount of the contract is about $139,000.

The Pittsburg Malleable Iron Co. has declared the regular quarterly dividend of 2½ percent and an extra dividend of 2½ percent, payable July 10.

Over fifteen miles of steel rails are to be laid by the National Tube Co., at McKeesport, Pa. A considerable part of the recently acquired land is to be devoted to freight yards.

The charcoal furnace of the Southern Car & Foundry Co., Gadsden, Ala., is temporarily shut down, owing to an accident. The bell fell in a few days ago and the lining was damaged.

The trustee of the Buffalo Spring & Gear Co., Buffalo, N. Y., has been ordered to sell the plant on July 15. The liabilities were given as approximately $350,000 and assets $250,000.

W. C. Wulff & Co., recently incorporated, Louisville, Ky., will continue the business of the firm of the same name, which is architectural sheet metal contracting business, manufacturing galvanized iron and copper cornices, and doing a general roofing business.

The Winget Machine Co., recently incorporated, York, Pa., will manufacture a specialty of its own invention. The company is looking for a suitable location and a bonus.

A safe deposit vault said to be the largest in the world has been built in the basement of the Frick building, Pittsburg. The vault is 43 feet long by 23 feet wide and 8 feet high; weighs 892,000 pounds, and has 22 plates of steel. It was made by the Bethlehem Steel Co.

The Big Etna plant of the Marting Iron & Steel Co., Ironton, O., was shut down for three days last week, on account of a peculiar accident. The hoist carriage stalled about six inches below the top of the stack and while the top-fillers were getting off the coke buggies, the engine gave way allowing the hoist to fall ninety feet. The alternating hoist was carried through the roof of the hoist house, wrecking the shieve-wheel. One laborer was fatally injured.

The E. M. Roberts Foundry & Engine Works, at Portsmouth, O., has secured the contract for a number of castings for the Cincinnati Machine Tool Co., of Cincinnati, and also a contract for a large bed plate for the Ironton Engine Co. The company has just installed a large engine in the Crooks mines at Oakview.

The Olive Foundry & Machine Co., Ironton, O., is working steadily with plenty of work ahead, including a number of large castings.